STUDIES IN AUSTRALIAN ACARINA

(2) TYROGLYPHIDAE (s.l.)

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Fig. 1–21.

The mites with which this paper deals are small, and except when they force themselves on our notice by sheer weight of numbers, are little known in Australia; nevertheless, they are of much economic importance.

Most of the species are free-living as adults, feeding upon organic matter such as various foodstuffs, grain, flour, cheese, etc., as well as in galls, where they eat the dead or dying gall-makers. These have sometimes been classed as the "Detriticolae", the few remaining forms which are parasitic on insects being the "Insecticolae".

Frequently certain species become serious pests of stored food materials, and, during the war of 1914–18, much work was done in England by Newstead and his associates on their effect upon flour and wheat. Other species attack cheese, and one may at times be a serious domestic nuisance in the upholstery of furniture.

During this present war period the necessity for again storing large quantities of wheat and other foodstuffs in Australia stresses the importance of the recognition of these mites, and this paper should assist in the determination of the species known to occur here. Most are cosmopolitan, and probably have been introduced by way of commerce; they are potential pests, and given suitable conditions may become of serious importance.

Apart from brief notes in Agricultural Journals, little has previously been recorded of their occurrence here. Rainbow, in his "Synopsis of the Australian Acarina" (Rec. Aust. Mus., vi, pt. 3, 1906), lists only the following: *Tyroglyphus queensland*iae Canestrini 1885, *T. entomophagus* Laboul. 1862, *T. siro* L. 1758, *Pullea discoidalis* Canestr. 1885, *Aleurobius farinae* De Geer 1778, and *Glyciphagus domesticus* De Geer 1778; while Lea, 1908, in "Insect and Fungus Pests of Orchard and Farm" (Tasmania), records *Rhizoglyphus echinopus* F. and R. 1868.

The material studied here, apart from that collected by the author and that housed in the South Australian Museum collections, includes a considerable amount kindly forwarded to me by the different State Departments of Agriculture, by the

Division of Economic Entomology, C.S. and I.R., Canberra, and by the Waite Institute, Adelaide. To all of these I extend sincere thanks for their assistance.

Diagnosis: Mostly small, soft-skinned mites of oval to rounded form. Gnathosoma visible from above, sometimes hidden beneath a camerostome. Mandibles usually chelate, sometimes with a thin saw-like blade. Maxillary palpi 2–5-segmented. Frequently a suture line between propodosoma and hysterosoma. A pair of vertical setae at front of propodosoma. Eyes usually absent except in some deutonymphs. Rarely with tracheae, but never with stigmal openings. Legs short or long, sometimes with spines; tarsi with sessile or pedunculate caruncle and claw, I and II usually with a more or less clavate sensory rod. IV in male frequently with a pair of adhesive discs. Sexual dimosphism generally well-marked, males often with a pair of round discs on each side of anus; genital aperture in both sexes mostly with a pair of tubercles on each side.

Nymphal stage frequently of two forms—one a hypopus, deutonymph, or resting stage without mouth-parts and with a posterior ventral plate furnished with 2–8 suctorial discs; generally found upon insects or other Arthropods.

Not parasitic on feathers of birds or fur of animals.

Recent studies of the Acarina by Oudemans, Vitzthum and others has led to the old family *Tyroglyphidae* s.l. being subdivided into 21 families for the recognition of which the following key is given. Nine are so far known to be represented in Australia.

KEY TO FAMILIES OF TYROGLYPHIDAE s.l.

(Mainly after Oudemans).

1. Mandibles chelate, without the saw-like process .. .. .. 2.
   Mandibles saw-, knife-, or stylet-like. Form variable. With or without suture between propodosoma and hysterosoma. Maxillary palpi flattened with two flagella-like appendages. Legs I and II lateral. Ambulacra with sessile claw and small caruncle. Female genital aperture a transverse slit between propodo- and hysterosoma. With pores (or discs) in female laterally between coxae II and III and medially between coxae IV, in male forming a quadrangle between coxae III and IV. Legs III and IV in deutonymph directed forwards. ANOETIDAE Oud. 1904.

2. Ambulacra with so-called sessile claw and caruncle; latter often small; suture between propodo- and hysterosoma; with propodosomal shield; ♀ genital aperture between coxae II and IV, ♂ between coxae IV; discs near anus and on tarsi IV in male. Larvae with sternal chitinous rods ("Bruststiele") 3.
   Ambulacra in adults with caruncle only, in larvae and nymphs with minute claws on pedunculate caruncles; tarsi ending claw-like. Suture between propodo- and hysterosoma. Genital aperture in both sexes behind coxae IV; ♀ with anal discs but no suckers on tarsi IV. Body setae loose; cuticle smooth; tarsi without spines. Larvae ? .. .. NANACARIDAE Oud. 1923.
   Ambulacra with pedunculate caruncle and apical claw, often minute .. 8.

3. Longer body setae loose and whip-like: in young stages often stiff and rod-like .. .. 4.
Body hairs rather short, hairy setae; body elongate, constricted behind legs IV; cuticle smooth .. .. Genus: ACARIDINA van Beneden 1870.

4. No cervical setae, these replaced by eye-like organs on a level with trochanters I .. .. LENZIIDAE Oud. 1928.
Cervical setae present or absent .. .. 5.

5. Cervical setae dorsal, on level with trochanter I, minute, smooth or absent. Cuticle smooth .. .. 6.
Cervical setae marginal, before trochanter I, minute, smooth; tarsi ventrally and distally with minute spines. Cuticle granulate EBERTIIDAE Oud. 1927.
Cervical setae marginal, before trochanter I, long, hairy, directed forwards and curved inwards and downwards; cuticle smooth; tarsi ventrally (sometimes also dorsally) and distally with minute spines TYROPHAGIDAE Oud. 1924.

6. No strong stout setae before sensory club on tarsi I and II; legs with or without spines, if present, may be long but never stout and conical. .. .. 7.
A stout conical spine before sensory club on tarsi I and II; legs short and thick with robust spines .. .. .. RHIZOGLYPHIDAE Oud. 1922.

7. Posterior portion of propodosoma with a transverse row of four long and equal setae .. .. TYROGLYPHIDAE Donn. 1868.
Posterior portion of propodosoma with only 2 long lateral setae or, if 4, then median ones very short .. .. .. CALOGLYPHIDAE Oud. 1929.

8. Cuticle smooth, shape more or less *Tyroglyphus*-like; partly with, partly without suture between propodo- and hysterosoma. Propodosomal shield uncertain. Larvae without sternal rods .. .. CARPOGLYPHIDAE Oud. 1923.
Cuticle smooth but not shining, distinctly but variably punctate or granulate. Dorsal setae strongly ciliated, feathered or comb-like. Larvae with sternal rods .. .. GLYCIPHAGIDAE Berl. 1887.
Cuticle leathery or scaled. Dorsum flattened, plate-like, round oval, diamond-shaped, or quadrangular. No sensory rod on tarsi I and II. Parasitic on insects .. .. CANESTRINIDAE Berl. 1884.
Cuticle smooth, comparatively strongly chitinized. Form oval to spindle-like. No suture between propodo- and hysterosoma. No propodosomal shield. Mouth-parts hidden under a production of the propodosoma (camerostome). CHORTOGLYPHIDAE Berl. 1897.
Cuticle smooth. Tarsi I and II with a long flexible process like an accessory claw. Not *Tyroglyphus*-like. With or without suture between propodo- and hysterosoma. With propodosomal shield. Larvae without sternal rods. Amongst seaweeds and algae between tide marks LENTUNGUIDAE Berl. 1897.
Cuticle smooth. Form *Tyroglyphus*-like. With propodosomal shield and suture between propodosoma and hysterosoma . .. .. 9.

9. Tarsi with (at least ?) 3 spoon-shaped or lanceolate setae; claws with ventral knob. Cervical setae marginal, minute, almost curved spines (adults unknown) .. .. OLAFSENIIDAE Oud. 1927.
Tarsi without such spoon-shaped or lanceolate setae .. .. . 10.

10. No cervical setae: ♂ without suckers near anus or on tarsi IV .. .. 11.
Cervical setae dorsal, minute, smooth; with easily visible "pinch organs"; ♂ with suckers near anus and on tarsi IV PONTOPPIDANIIDAE Oud. 1925.

Cervical setae marginal, long, hairy, directed forwards and curved inwards and downwards .. .. 12.

11. Female genital aperture between coxae III and IV, male between coxae IV. ENSLINIELLIDAE Vitz. 1924.

Male and female genital apertures between coxae IV. WINTERSCHMIDTIIDAE Oud. 1924.

Female and male genital aperture behind coxae IV. CZENSPINSKIIDAE Oud. 1927.

12. Claws in larvae and nymphs single, in ♀ all legs, and legs I and II of ♂ Y-shaped; ♀ genital aperture between coxae III, heteromorphous ♂ between trochanters IV; ♂ with anal suckers and discs on tarsi IV. Larvae with sternal rods .. .. LARDOGLYPHIDAE Oud. 1927.
Claws single; ♀ genital apertures between coxae IV, ♂ between trochanters IV; no anal suckers or tarsal discs in ♂ .. SAPROGLYPHIDAE Oud. 1924.

In this paper 21 species are listed. Six of these are regarded as new, the remainder, with three exceptions, being cosmopolitan and probably introductions to Australia. Two previously described species are regarded as requiring rediscovery and study.

LIST OF SPECIES.

Tyroglyphus farinae (Linné 1758).
Thyreophagus entomophagus (Lab. 1852).
Thyreophagus corticalis (Michael 1885).
Caloglyphus berlesei (Michael 1903).
Caloglyphus mycophagus (Megnin 1874).
Rhizoglyphus echinopus (Fumouze and Robin 1868).
Rhizoglyphus termitum sp.nov.
Tyrophagus putrescentiae (Schrank 1781).
Saproglyphus coceiphagus sp.nov.
Carpoglyphus lactis (Linné 1763).
Calvolia glabra sp.nov.
Glycyphagus domesticus (De Geer 1778).
Glycyphagus cadaverum (Schrank 1781).
Ctenoglyphus plumiger (Koch 1835).
Sennerlia queenslandica sp.nov.
Sennerlia bifilis (Canestrini 1898).
Histiostoma feroniarum (Dufour 1839).
Histiostoma nicholsi sp.nov.
Anoetostoma oudemansi g. et sp.nov.
Incertae sedis:
Pullea discoidalis Canestrini 1898.
Tyroglyphus queenslandiae Canestrini 1898.

FAMILY TYROGLYPHIDAE Donnadieu (1868), Oudemans (1932).

Oudemans, 1932, restricts this family to the single genus *Tyroglyphus* Latreille, of which there appears to be only one (at least well known) species, *Tyroglyphus farinae*.

TYROGLYPHUS Latreille.

Acarus (*part*) Linnaeus: Syst. Nat. ed. x, 1758, p. 617.

Aleurobius Canestrini: Tiroglifidi 1888, p. 7; Berlese: A.M.S., fasc. lxxxv, No. 12, 1898; Kramer: Das Tierreich, Lfg. vii, 1899, p. 137; Michael: Brit. Tyroglyphidae, ii, 1903, p. 71; Rainbow: Rec. Aust. Mus., vi, 1906, p. 180; Newstead: Rept. Grain Pests (War) Committee, No. 8, Roy. Soc., 1920, p. 20.

Tyroglyphus Latreille: Precis Caract. Ins., 1796, p. 185; Vitzthum: Tierwelt Mitteleuropas, iii, 1929, p. 73; Oudemans: Ent. Bericht., viii, 1932, p. 356.

Propodo- and hysterosoma separated by a suture. Propodosoma with a posterior row of four long, subequal setae. Cervical setae (a pair of short setae on sides of propodosoma about in line with trochanters of leg I) present and ciliated. Tarsi I and II with sensory club. Long seta of segment II of legs arising beyond middle of segment. Genital aperture in both sexes with a pair of tubules on each side. Male with a pair of large anal discs, a pair of discs on tarsi IV, and with a strong spine-like apophysis on second segment of leg I. Apex of hysterosoma in both sexes with only a single pair of long setae.

Deutonymph with dorsal cuticle finely punctate; suctorial plate with 8 discs, median pair a little larger than rest, one on each side of vulva, none on coxae I and III.

TYROGLYPHUS FARINAE (Linnaeus).

(Meal or Flour Mite).

Acarus farinae Linnaeus: Syst. Nat., ed. x, 1758, p. 617.

Tyroglyphus farinae Gervais in Walckenaer, Ins. Apt., iii, 1844, p. 142; Berlese: A.M.S., fasc. xiv, No. 9, 1884; Vitzthum: Tierwelt Mitteleuropas, iii, 1929, p. 73.

Aleurobius farinae Canestrini: Tiroglifidi, 1888, p. 7; Kramer: Das Tierreich, Lfg. vii, 1899, p. 137; Michael: Brit. Tyroglyphidae, II, 1903, p. 71; Rainbow: Rec. Aust. Mus., vi (3), 1906, p. 180; Newstead: Rept. Grain Pests (War) Committee, No. 2, Roy. Soc., 1920, p. 20.

Length of adults, ♀ to 0·7 mm., width to 0·4 mm.; ♂ length to 0·55 mm., width to 0·35 mm.; of deutonymph, length 0·215 mm., width 0·17 mm. Body of both sexes ovate as figured. The dorsal and ventral views of female, ventral view of male, first leg of male, and fourth tarsus of male showing suctorial discs are figured and require no further description.

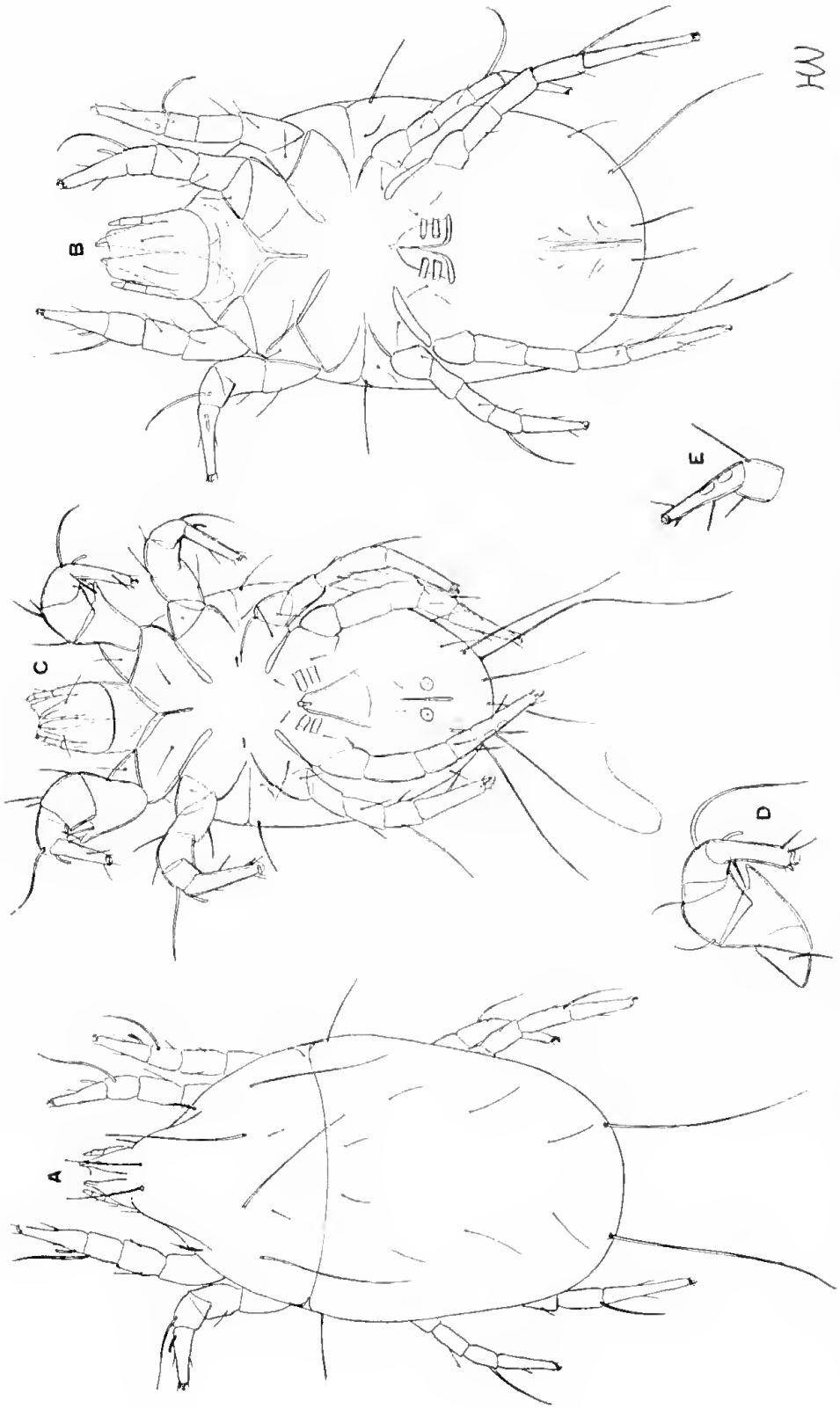

Fig. 1. *Tyroglyphus farinae* (L.) (adult). A, ♀ dorsal; B, same, ventral; C, ♂ ventral; D, leg 1 of ♂; E, tarsus 4 of ♂.

The deutonymph or "hypopus" is also figured from specimens taken in packing straw from England.

As the name of this species implies, it is a frequent pest in all kinds of stored farinaceous material, but it is also known to attack cheese and the pollen of beehives. The male is at once recognized by the first leg.

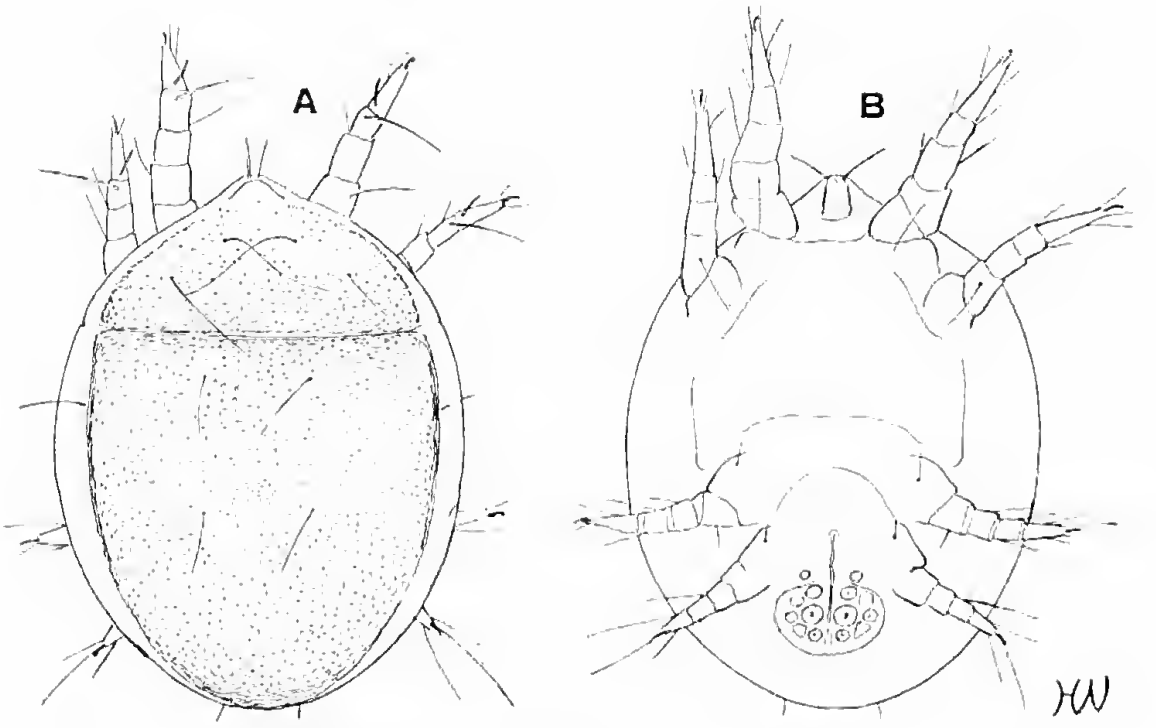

Fig 2. *Tyroglyphus farinae* (L.) (deutonymph): A, dorsal view; B, ventral view.

Loc. South Australia, Adelaide: Adults and deutonymphs from packing straw from England, May, 1934. Victoria. Burnley: On ground near mustard crop, July, 1934. (R.T.M.P.)

Rainbow (1906) only says "Australia (introduced)".

FAMILY CALOGLYPHIDAE Oudemans (1932).

Acarologische Aanteekeningen, cxii, Entom. Berichten, 1932, Dl. viii, p. 356.

This family was erected by Oudemans to include all the genera previously considered as in the Tyroglyphidae, with the exception of *Tyroglyphus* itself.

It is represented in Australia by the two genera *Thyreophagus* and *Caloglyphus*, each with two species, all of which are well-known in Europe and probably introduced into Australia.

THYREOPHAGUS Rondani.

Thyreophagus Rondani: Bull. Soc. ent. Ital., vi, 1874, p. 67.
Histiogaster Berlese: Riv. Acc. Padova, xxxiii, 1883, p. 45.
Monieziella Berlese; A.M.S., fasc. lxxxix, No. 9, 1897.

Genotype: *Tyroglyphus entomophagus* Lab. 1852.

Elongate to elongate-oval species with suture between propodo- and hysterosoma. Propodosoma with two posterior long setae only. Cervical setae? Both sexes with genital tubules; ♀ genital aperture between coxae III and IV, ♂ between coxae IV. Male with a posterior shield-like projection and a pair of discs near anus. Tarsi of legs I and II with sensory club; long seta of segment II of legs arising beyond middle; leg IV of ♂ without discs. Deutonymph, where known, with a pair of eye-like organs on a level with bases of trochanters I and placed laterally.

THYREOPHAGUS ENTOMOPHAGUS (Lab.).

Acarus entomophagus Laboulbene: Ann. Soc. ent. France, 1852; "Bull.", p. 54 (lit.).
Thyreophagus entomophagus Rondani: Bull. Soc. ent. France, v. 1874, p. 67.
Tyroglyphus entomophagus Laboulbene et Robin: Ann. Soc. ent. France, ser. 4, ii, 1868, pp. 317–338, pl. x; Rainbow: Rec. Aust. Mus., vi (3), 1906, p. 180.
Tyroglyphus malus Murray: Econ. Entom., Aptera, 1877, p. 275.
Monieziella entomophaga Berlese: A.M.S., fasc. lxxxix, No. 9, 1898.
Histiogaster entomophagus Kramer (part): Das Tierreich. Lfg. vii, 1899, p. 142.

This is a less elongate and more oval species than the following, and is at once distinguished therefrom. Beyond giving the present figures from Australian material, it is hardly necessary to describe it in detail, for this has been done very thoroughly by Michael (1903) and Newstead (1930).

Length of ♂ 0·4 mm., width 0·18 mm.; of ♀ 0·5 mm., and 0·21 mm. respectively. The deutonymph is devoid of a suctorial plate and discs, but is said to possess lateral eyes as in the next species. It is unknown to me.

This species is as important a pest of flour and other farinaceous material as the previous one, and causes similar damage. Both species are responsible for the characteristic odour of infected flour.

Rainbow (1906) merely states "Australia, introduced", but I have material from flour labelled "Sydney, N.S.W., July 6, 1934".

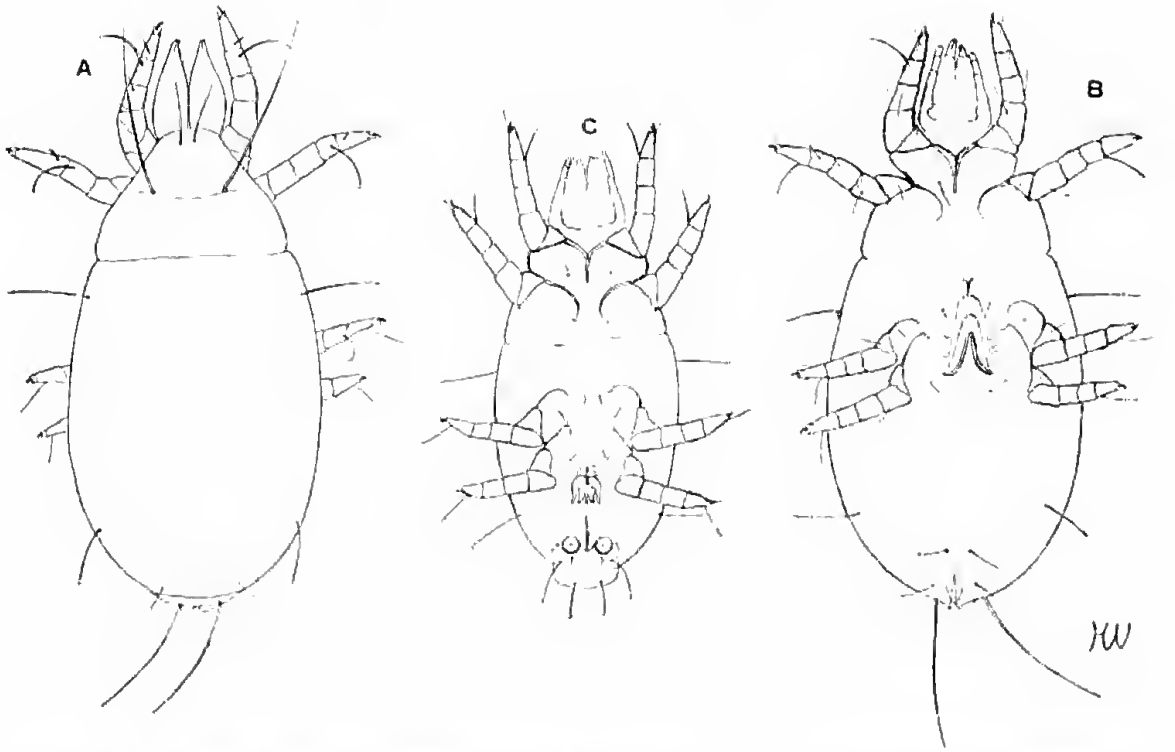

Fig. 3. *Thyreophagus entomophagus* (Lab.) (adult): A, ♀ dorsal; B, same, ventral; C, ♂ ventral.

THYREOPHAGUS CORTICALIS (Michael).

Tyroglyphus corticalis Michael: J. R. Microsc. Soc., ser. II, v, 1885, pp. 27–31, p. 885, pl. iii, figs. 1–14.

Histiogaster entomophagus Kramer (part): Das Tierreich, Lfg. vii, 1899, p. 142.

Histiogaster corticalis Berlese: A.M.S., fasc. lvii, No. 7, 1890; Michael: Brit. Tyroglyphidae, ii, 1903, p. 66; Vitzthum: Tierwelt Mitteleuropas, iii, 1929, p. 74.

Monieziella mali Berlese: A.M.S., Crypt, 1897, p. 107.

A much more elongate and parallel-sided species than the preceding, it is easily recognized. Vitzthum (*loc. cit.* 1929), because of the supposed absence of the vertical setae, which are not figured by Michael (1903) or Berlese (1889–91), questions the placing of this species in the above genus. In all the Australian material before me, however, these vertical setae are distinctly present as in figure 3A; otherwise my material agrees, and one can only assume that this pair of setae was overlooked.

The size of the specimens is: ♂ length to 0·35 mm., width to 0·1 mm.; ♀ 0·45 mm. and 0·12 mm. respectively. The cuticle is generally not so chitinized as in *entomophagus*. As to the detailed description, the figures are sufficient. The deutonymph possesses a pair of lateral eye-like organs on the level of trochanters I, and to facilitate its recognition I give figure 35 (after Michael).

Michael found this species feeding under the epidermis of *Arundo phragmites* in England, and Berlese found it on *Polyporus hirsutus* in Italy.

Loc. New South Wales: Castle Hill, 24th July, 1934, in frass on Cypress Pine; Sydney, 16th August, 1934, under bark of Mistletoe; Sydney, 16th May, 1939, on Camellia bud.

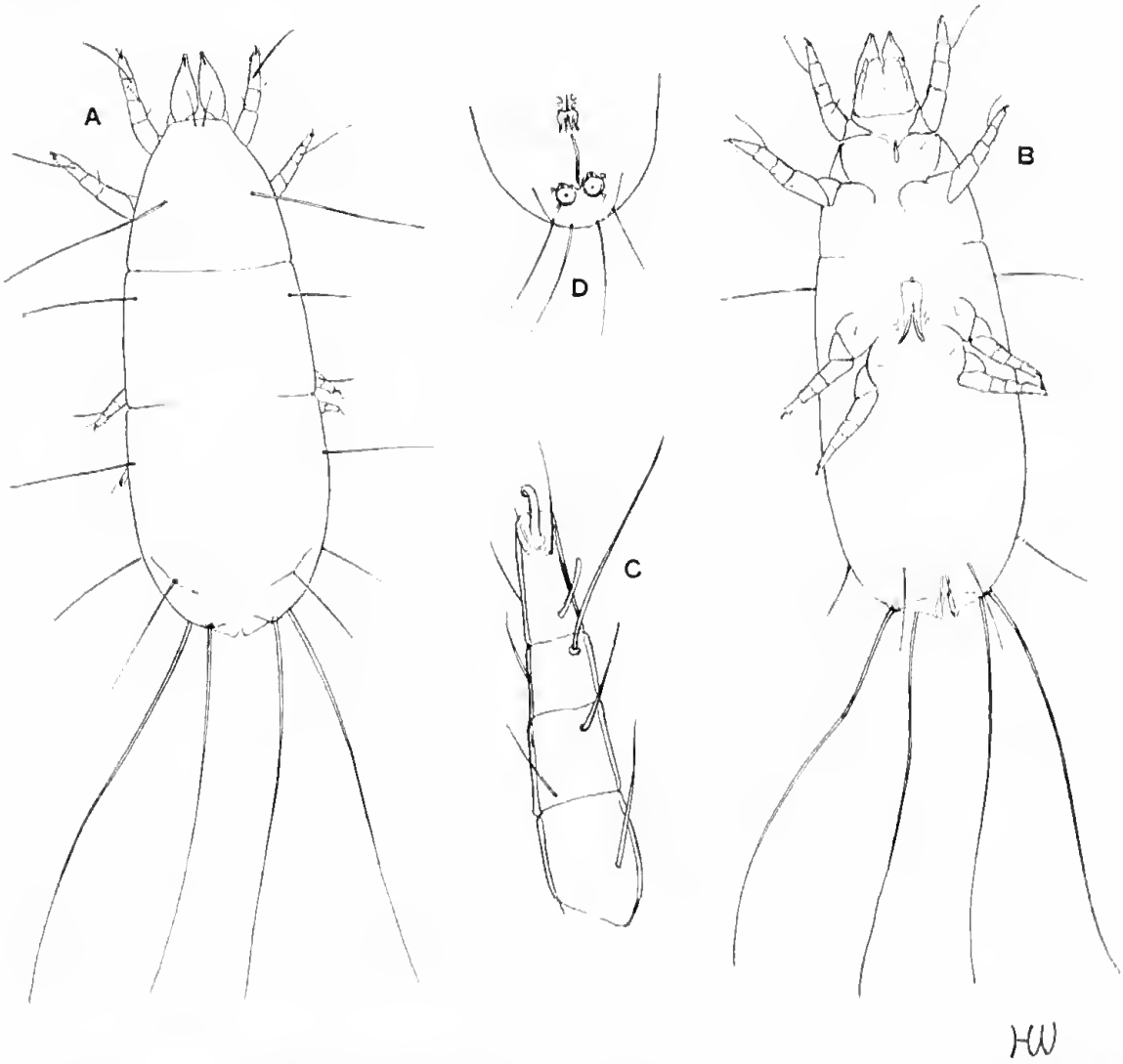

Fig. 4. *Thyreophagus corticalis* (Mich.) (adult): A. ♀ dorsal; B, same, ventral; C, leg 1 of ♀; D genital aperture and anal discs of ♂.

CALOGLYPHUS Berlese.

Centuria sesta di Acari Nuovi: Redia xv, 1923, p. 262.

Genotype: *Tyroglyphus krameri* Berlese, 1881.

Oval form, with suture between propodosoma and hysterosoma. Propodosomal shield present or doubtful. Propodosoma with posterior row of 4 setae of

which the median pair are very short. Cervical setae present or not, sometimes ventro-laterally at extreme apex of propodosoma a pair of thick rod-like setae. Tarsi I and II apically with a pair of long setae sometimes lanceolate; without a stout spine in front of the sensory club; segment II of legs with the long seta arising subapically; tarsi with a few stoutish spines; tarsi IV in male with a pair of discs. Genital aperture in both sexes between coxae IV, with a pair of tubules on each side. Male with a pair of anal discs.

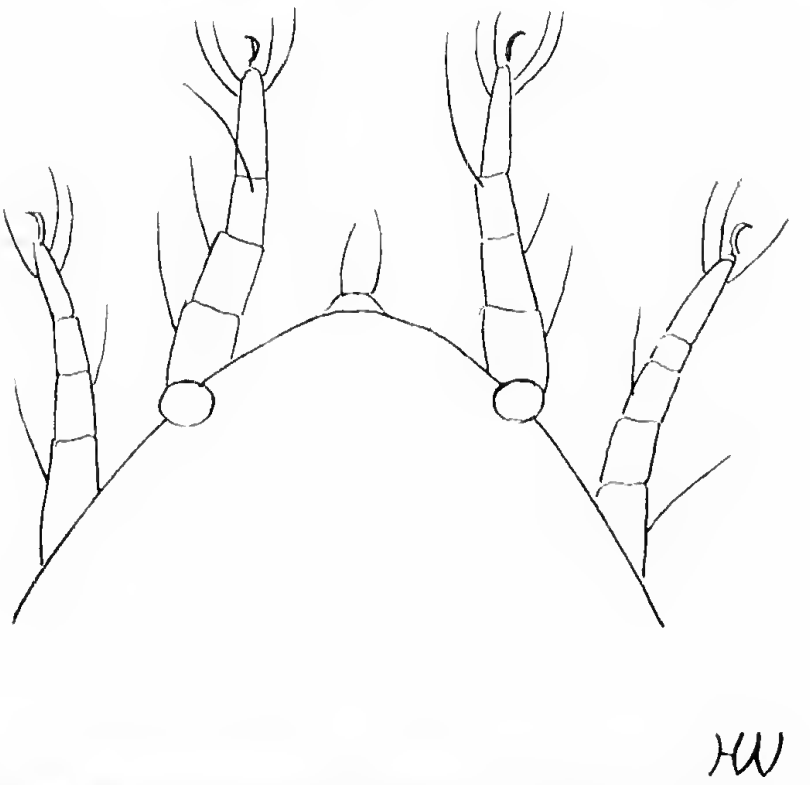

Fig 5. *Thyreophagus corticalis* (Mich.) (deutonymph): Anterior portion from above showing eye-like organs (after Michael).

CALOGLYPHUS BERLESEI (Michael).

Tyroglyphus mycophagus Berlese: A.M.S., fasc. lviii. No. 1. 1891; Kramer: Das Tierreich, Lfg. vii, 1899, p. 139.
Tyroglyphus berlesei Michael: Brit. Tyroglyphidae, ii. 1903. p. 116.
Caloglyphus berlesei Berlese: Redia, xv, 1923. p. 262.

I have a large amount of Australian material of this species, all of which agrees with the descriptions and figures given by Berlese and Kramer for *Tyroglyphus mycophagus* Megnin 1874. Michael (1903), however, has shown that *mycophagus* Megnin is quite a different species, being really that figured by Berlese in 1888 (A.M.S. xlix, No. 10) as *Tyroglyphus krameri*.

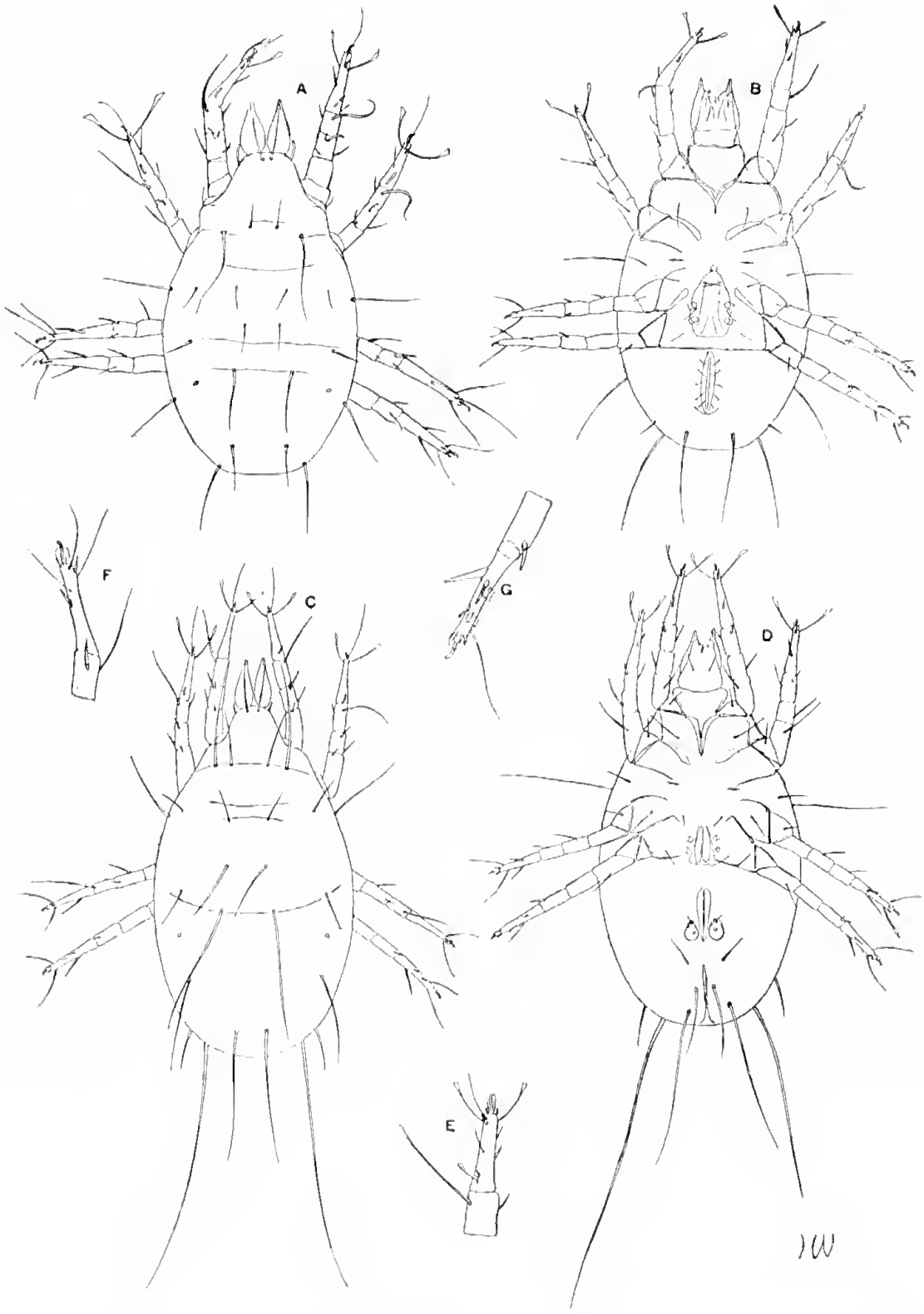

Fig. 6. *Caloglyphus berlesei* (Michael) (adult): A, ♀ dorsal; B ♀ ventral; C, ♂ dorsal; D, ♂ ventral; E, tarsus 1; F, tarsus 3; G, tarsus 4 of ♂.

In my specimens there does not appear to be any cervical setae, unless the pair of curved rods near the extreme tip of the propodosoma can be regarded as such. The median pair of setae in the row of four on the posterior part of the propodosoma are longer and not so spine-like as those shown by Berlese and Kramer, but in these latter they may possibly be fore-shortened.

Length of ♂ to 0·95 mm., width to 0·42 mm.; of ♀ to 2·0 mm. and 1·0 mm. respectively.

Loc. Western Australia: Claremont, 21st April, 1931 (H.W.). South Australia: Adelaide, on yam from China, 1909 (T.H.J.). Aust. Capital Territory: Canberra, from killed mound of *Eutermes exitiosus* (no date, G.F.H.); in laboratory culture of same termite, June, 1934 (G.F.H.). Fiji: On banana beetle, 2nd May, 1934; on copra, Levuka, 1939 (R.A.L.).

CALOGLYPHUS ? MYCOPHAGUS (Megnin).

Tyroglyphus mycophagus Megnin: J. Anat. Physiol., x, 1874, p. 225.
Tyroglyphus phylloxerae Riley: Sixth Rept. Ins. Missouri, 1874, p. 52.
Tyroglyphus krameri Berlese: Atti. Ist. Veneto, ser. 5, viii, 1881, p. 13; A.M.S. fasc. xlix, No. 10, 1888; Michael: Brit. Tyroglyphidae, ii, 1903, p. 109.
Caloglyphus mycophagus Vitzthum: Tierwelt Mitteleuropas, iii, 1929, p. 74.

This species in the adult stage differs from the preceding in the strength of the dorsal setae, the apparent lack of the antero-lateral rod-like setae on the anterior part of the propodosoma, and the presence of distinct ciliated cervical setae. The last feature, however, does not appear to be figured by either Michael or Berlese, hence the material is referred to *mycophagus* with some doubt. The propodosomal shield is also distinctly present in my material.

Loc. Victoria, Burnley, October, 1939 (R.T.M.P.) on bulbs imported from China.

FAMILY RHIZOGLYPHIDAE Oudemans 1923.

Characterized by the short thick legs and the presence of a stout short conical spine immediately in front of the sensory rod on tarsi I and II.

RHIZOGLYPHUS Claparède.

"Studien an Acariden" in: Zeit. f. wiss. Zool., xviii (1868), p. 508.

Broadly oval species with short stout legs; generally well chitinized. Ambulacra sessile. With suture between propodosoma and hysterosoma. Propodosoma with distinct shield and a posterior row of only two long setae. Front portion of hysterosoma with a quadrilateral of four setae. No posterior hysterosomal shield.

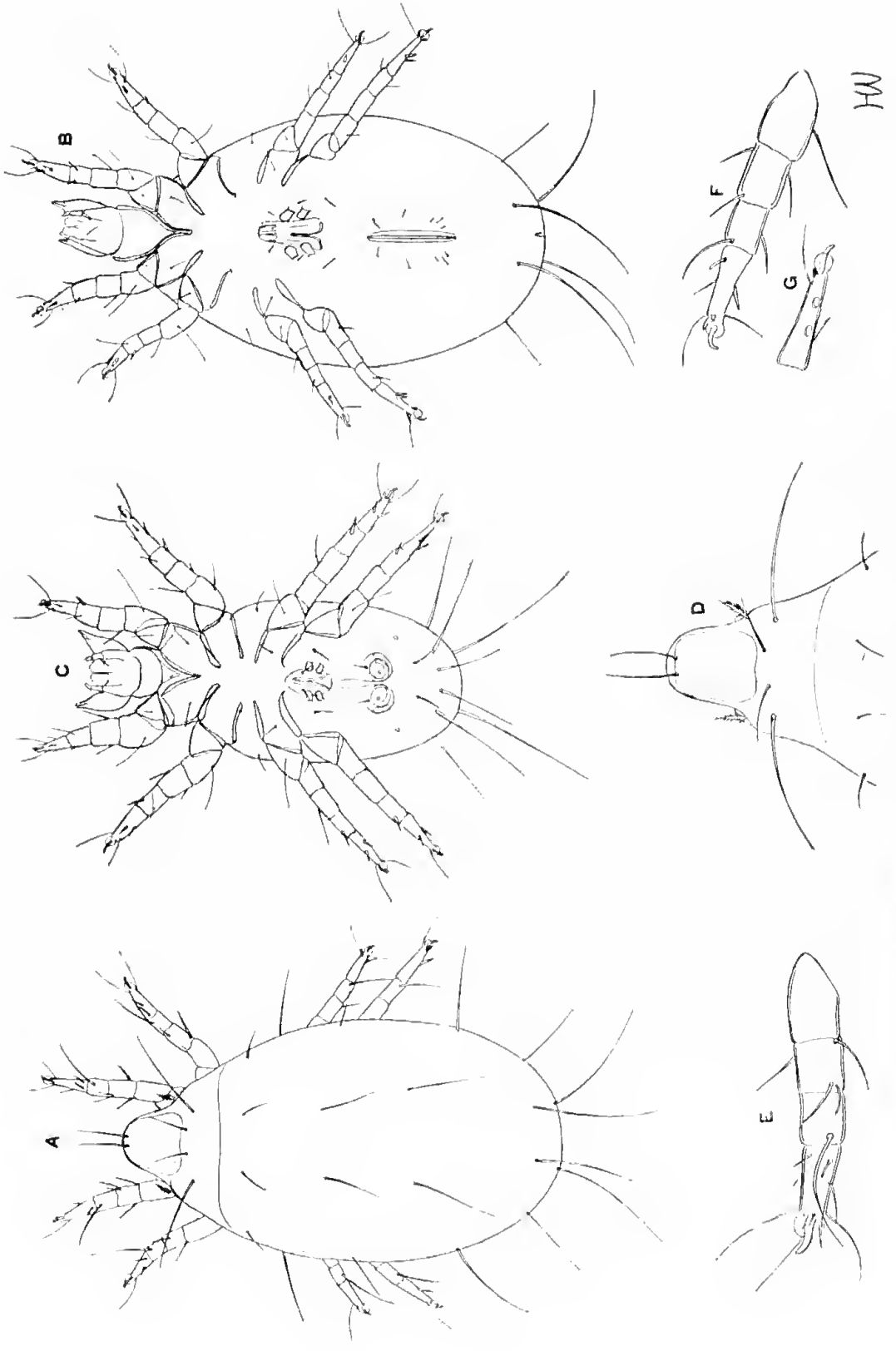

Fig. 7. *Caloglyphus mycophagus* (Megnin) (adult): A, ♀ dorsal; B, ♀ ventral; C, ♂ ventral; D, propodosoma dorsal; E, leg 1 of ♀; F, leg 2 ♂; G, tarsus 4 ♂.

Cervical setae absent. Tarsi apically with 2 ventral, more or less lanceolate setae; a short stout conical spine immediately after the sensory club. Genital aperture of ♀ between coxae III and IV, ♂ between coxae IV, both with a lateral pair of tubules. Anus of ♂ with a pair of large semi-circular discs.

Deutonymph with all coxae touching, I and III with a small circular pore or disc; another on each side of vulva. Suctorial plate with 8 discs, the median pair long.

RHIZOGLYPHUS ECHINOPUS (Fumouze et Robin).

(Bulb or Eucharis Mite).

Tyroglyphus echinopus Fumouze et Robin: J. Anat. Physiol., v, 1868, p. 287.
Rhizoglyphus echinopus Murray: "Econ. Entom." Aptera, 1877, p. 257; Kramer: Das Tierreich, Lfg. vii, 1899, p. 143; Michael: Brit. Tyroglyphidae, ii, 1903, p. 84; Lea: Insect and Fungus Pests of Tas., 1908, p. 89; Vitzthum: Tierwelt Mitteleuropas, iii (7), 1929, p. 74.
Corpophagus echinopus Megnin: "Les Parasites", 1880, p. 144.
Tyroglyphus megnini Berlese: A.M.S., fasc. xiv, No. 7.

There appears to be but one well-known species, characterized as in the generic details given above and the accompanying figures.

It is a well-known pest in Europe and America on all kinds of bulbs and tubers, but whether it actually initiates damage to healthy bulbs has been doubted by Michael.

According to Michael (1903), p. 95, Mangin and Viala, in C.R. Ac. Sci. cxxxiv, pp. 151–3, say that they received this species from Australia. The figure given by Lea (1908) for this species, which he refers to as "A Destructive Root Mite", leaves no doubt but that his determination was correct. He gives no locality other than Tasmania in general.

Loc. New South Wales: Windsor, 15th May, 1934, on dahlia tubers (Dept. Agr.). New Zealand: Auckland, from bulbs, 1938.

RHIZOGLYPHUS ? TERMITUM sp. nov.

Deutonymph: Length 78μ., width 65μ, almost round in form and strongly convex. Dorsum with a shield of the same outline, outside of which the cuticle is longitudinally striated, while laterally inside the shield are a pair of longitudinal sinuate lines almost extending to the posterior margin; laterally outside these lines the shield is longitudinally striated, while inside the surface is finely spotted (or pitted), in places the spots (or pits) clumping together. Dorsum apparently without setae, except for 2 pairs of very small fine ones posteriorly. Ventrally the

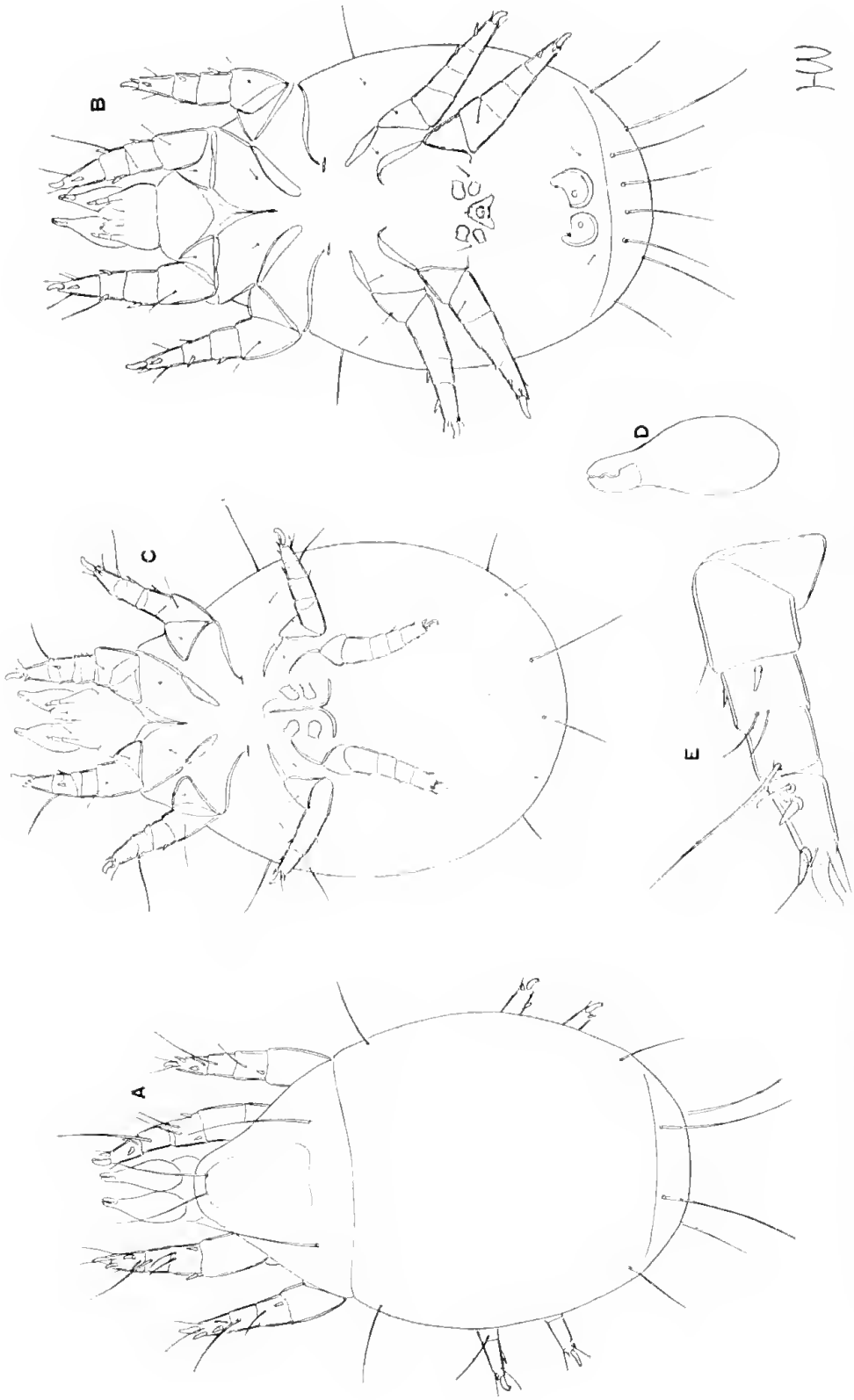

Fig. 8. *Rhizoglyphus echinopus* (R. and F.) (adult): A, ♂ dorsal; B, ♂ ventral; C, ♀ ventral; D, mandible; E, leg 1.

coxae are very large, all in contact and occupying most of the surface. Legs fairly short and stout, all tarsi with a long sinuate claw and strong spines, but without subapical lanceolate setae. Legs I and II with long and strong spines. Segment II of leg I with an apical clavate rod-like seta. Gnathosomal process as figured. Coxae I and III with a small disc or pore, and another on each side of vulva. Suctorial

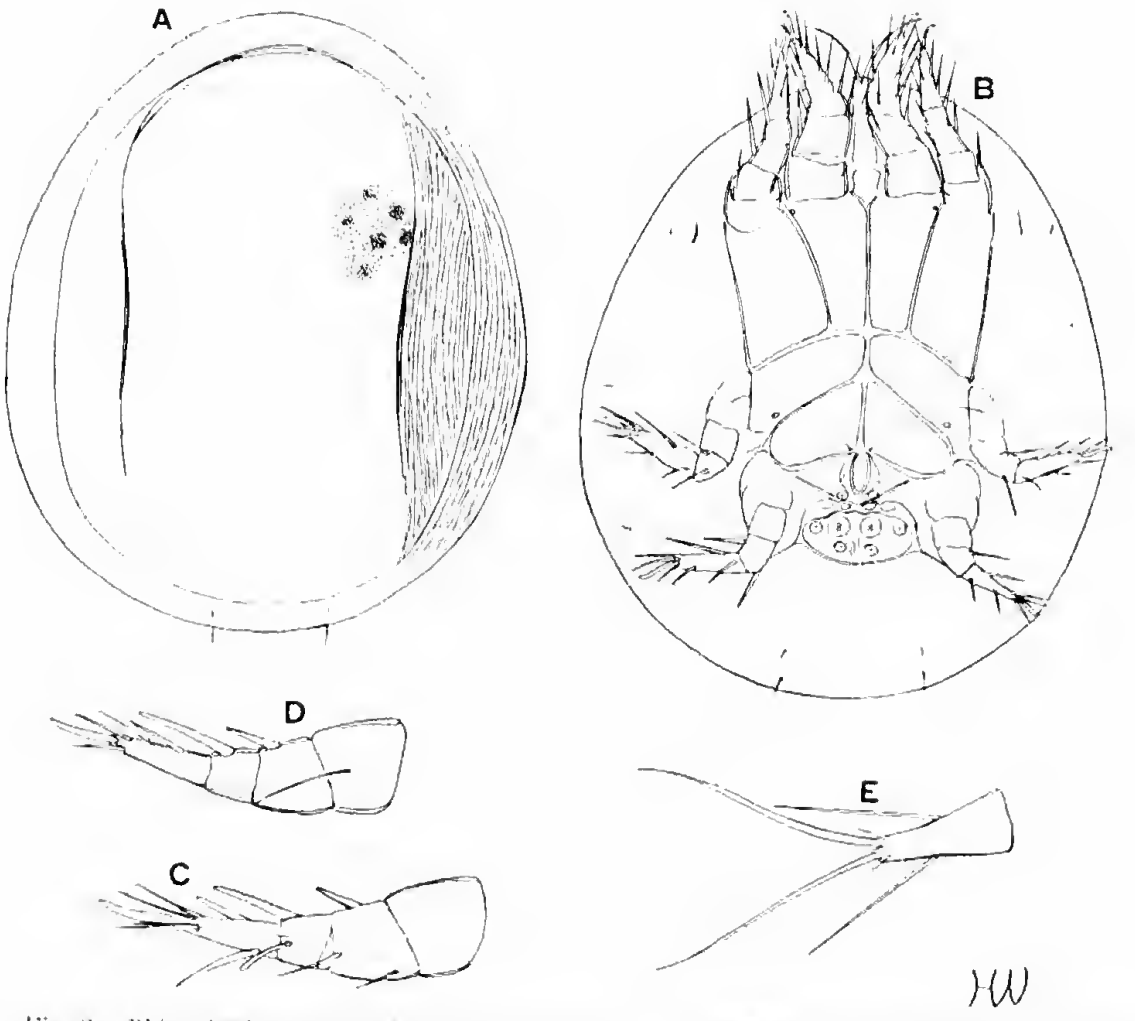

Fig. 9. *Rhizoglyphus termitum* n.sp. (deutonymph): A, dorsal; B, ventral; C, leg I dorsal; D, same, ventral; E, tritosternum.

plate with 6 (?8) discs, a pair of large median ones, a smaller one on each side of these, and two small posterior ones; anterior of the large median discs there may be another pair, but it is difficult to decide whether these are discs or the semi-circular structure found between each two outer discs. Outside of the coxae are a few short fine setae.

Remarks: The uncertainty of the anterior pair of suctorial discs, the strong spines on tarsi I and III, the lack of lanceolate tarsal setae, and the structure of the

dorsal plate render it uncertain whether this deutonymph is a true *Rhizoglyphus* or not.

Loc. Aust. Capital Territory: Canberra, associated with *Eutermes exitiosus*, May, 1930 (G.F.H.). New South Wales: With *Porotermes* sp., Eden, June, 1940 (S.L.A.).

FAMILY TYROPHAGIDAE Oudemans.

Ent. Berichten, 1924, D1, vi, p. 302.

Characterized as in the key to families. With only one genus so far known to occur in Australia.

TYROPHAGUS Oudemans.

Ent. Berichten, 1924, D1, vi, p. 250.

Of oval form with distinct suture between propodosoma and hysterosoma. Propodosoma with a posterior row of four long setae, the inner pair slightly the longer. Cervical setae present and ciliated. Hysterosomal setae long and shortly (often uncertainly) ciliated. Genital aperture of ♀ between coxae III and IV, of ♂ between coxae IV, on each side a pair of tubules. Male with a pair of anal discs, and discs also on tarsi IV. Tarsi I and II with sensory rod but no strong spines; the long seta on segment II of legs subapical. Tarsi relatively long and slender.

Genotype: *Acarus putrescentiae* Schrank 1781.

This genus is represented in Australia by the following ubiquitous and cosmopolitan "humus mite".

TYROPHAGUS PUTRESCENTIAE (Schrank).

Acarus putrescentiae Schrank: Enum. Ins. Austriae, 1781, p. 521.
Acarus dimidiatus Herman: Mem. Apt., 1802, p. 85.
Tyroglyphus longior Gervais: Aptera, iii, 1844, p. 262.
Tyroglyphus infestans Berlese: A.M.S., fasc. xiv, No. 8.
Tyroglyphus lintneri Osborne: 1894 (Banks: U.S. Dept. Agric., Techn. Ser. No. 13, 1906, p. 15.
Tyroglyphus siro Rainbow: Rec. Aust. Mus., vi (3), 1906, p. 180; Lea: Ins. and Fungus Pests, Tas., p. 112.
Tyrophagus humerosus Oudemans: Ent. Ber., vi, 1924.
Tyrophagus dimidiatus Vitzthum: Tierwelt Mitteleuropas, iii, 1929, p. 74.
Tyrophagus putrescentiae Vitzthum: Treubia, viii, 1926, p. 180.

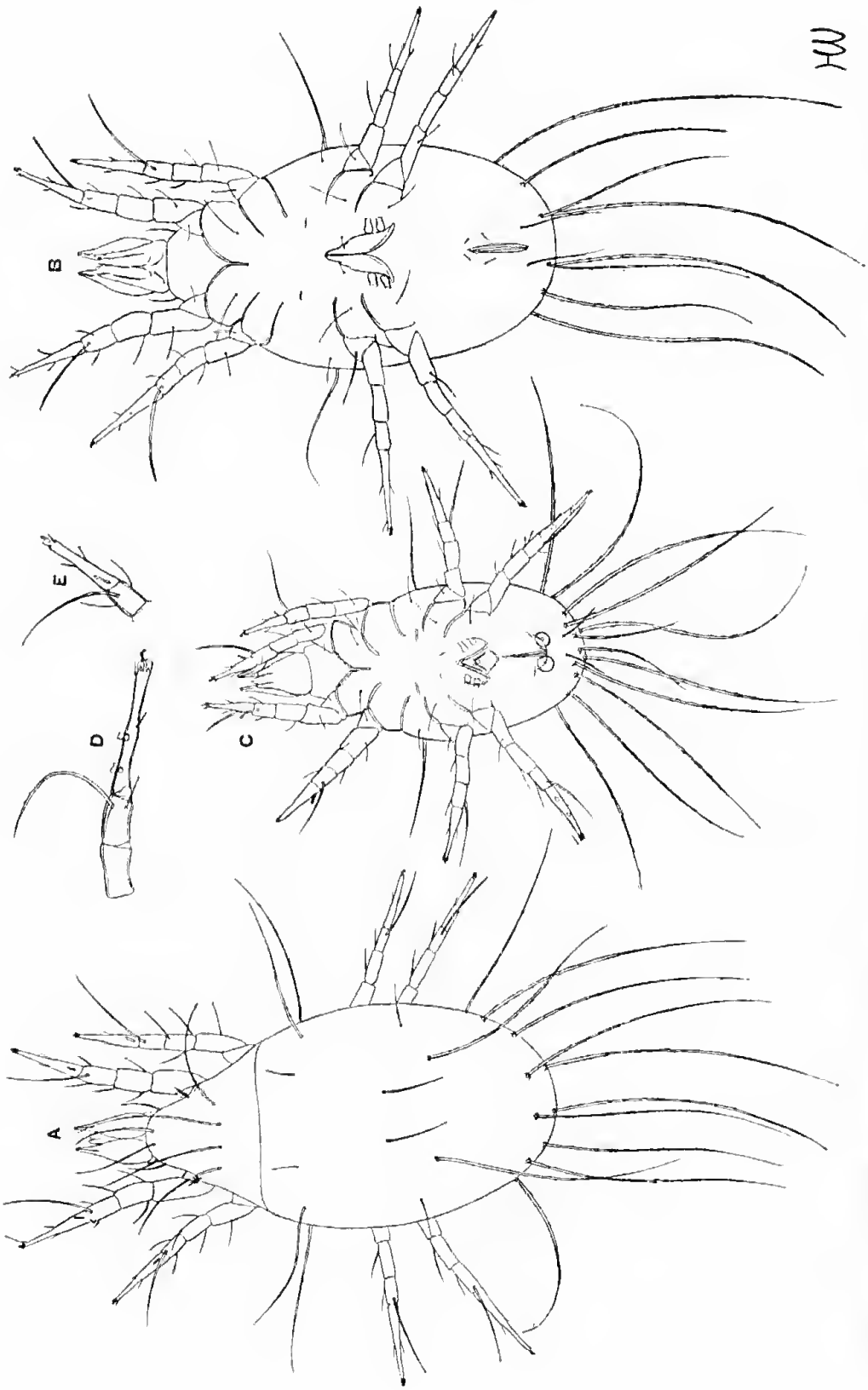

Fig. 10. *Tyrophagus putrescentiae* (Schrank) (adult): A, ♀ dorsal; B, ♀ ventral; C, ♂ ventral; D, tarsus 4 ♂; E, tarsus 2.

The first five of the above synonyms are generally regarded as varieties, but the differences are very small and uncertain, being to a large extent based on habitat, so that there seems little point in regarding them all other than as the one species. The essential characters of the species are adequately shown in the accompanying figures.

This species occurs almost everywhere in decaying humus, dung, rotting timber and fruit, and even on cheese and other foodstuffs; it is widespread in Australia.

Loc. South Australia: Adelaide, in egg powder from London, labelled as "*T. siro*", no date; on decaying mushrooms, Feb., 1934 (D.C.S.); on *Cryptes baccarum*, Aug., 1933; in moss, Mount Barker, June, 1934 (H.W.); on decaying coconut, Adelaide, Aug., 1939 (H.W.). Western Australia: Perth, April, 1931 (H.W.); Wooroloo, Aug., 1932 (H.W.). Victoria: In leaf debris, Mount Dandenong, May, 1932 (J.W.R.). New Zealand: Auckland, May, 1940, in fungus culture (W.C.); Lincoln, August, 1935 (L.M.).

Rainbow (1906) merely says: "Australia, introduced."

FAMILY SAPROGLYPHIDAE Oudemans.

Entom. Berichten 1924, D1, vi, p. 303.

Cuticle polished. Mandibles chelate. Ambulacra with sessile claw and caruncle. Body more or less Tyroglyphid-like, with suture between propodosoma and hysterosoma. Female genital aperture between coxae III and IV. Male without discs near anus or on tarsi IV; larvae without sternal rods (?).

This family contains only the genus *Saproglyphus* Berlese, although Vitzthum (1931) is inclined to include the genus *Acaridina* van Beneden.

SAPROGLYPHUS Berlese.

A.M.S., fasc. lvii, No. 6, 1890.

Elongate species with more or less parallel sides. Propodosoma separated from hysterosoma by a suture. Propodosoma with a posterior transverse row of 4 setae, the laterals very long and strong, medians small. Cervical setae absent. Hysterosoma with 2 or 4 long posterior setae. Ambulacra and claws sessile. Tarsi rather elongate, without strong spines, with the usual sensory rod on I and II; segment II of legs with the long seta subapical. Genital aperture of ♀ between coxae III and IV, ♂ between IV, in both sexes with a pair of tubercles on each side. Male without anal discs or suckers on tarsi IV.

Genotype: *S. neglectus* Berlese 1890.

This genus is represented in Australia by the following new species or what may be only a variety of the European form.

SAPROGLYPHUS COCCIPHAGUS sp.nov.

Description: Female, length to 340μ, width to 185μ; male, length to 270μ, width to 135μ. Female, dorsal surface: propodosoma with the usual pair of vertical setae 65μ long, and 4 posterior setae in a transverse row, the outer ones very long and strong, 130μ, inner ones very much shorter, 26μ; hysterosoma with a pair

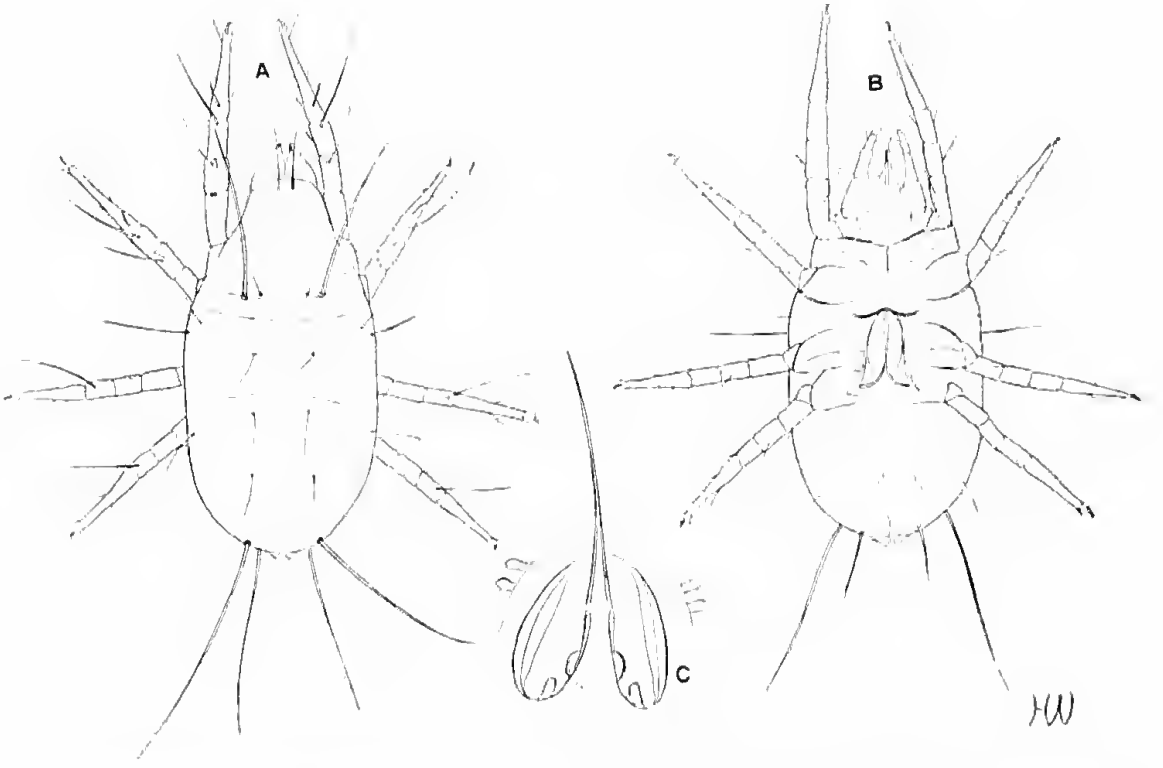

Fig. 11. *Saproglyphus cocciphagus* n.sp. (adult): A, ♀ dorsal; B, ♀ ventral; C, genital aperture and penis of male.

of humeral setae, outer 104μ, inner 26μ; dorsally with 3 pairs of fine and moderately long setae; apically with only one pair of long setae, 260μ; laterally, on a level of trochanter IV, a pair of medium fine setae; all setae simple. Ventral surface: coxae I, III and IV with one fine seta of medium length; apex with one pair of long setae 130μ; anterior of apex with a transverse row of fine setae; genital aperture large, placed between coxae III and IV with the usual 2 pairs of tubercles. Male, as in female, but the apical setae of the hysterosoma not so long; genital opening between coxae IV with the usual 2 pairs of tubercles; penis long, fine and pointed;

tarsi IV and anus without suctorial discs. Legs relatively long and slender, ambulacra and claws sessile, tarsi elongate without spines, tarsi I and II with a rather slender sensory rod near base, segment II of legs with a long seta arising subapically.

Loc. South Australia: Adelaide, Aug., 1933, on *Cryptes baccarum* (type material). New South Wales: Goulburn, 7th June, 1934, from gall on tree-lucerne.

Remarks: This new species is very close to the genotype, *S. neglectus* Berlese, but differs in having only one pair of long dorsal apical setae instead of two.

FAMILY CARPOGLYPHIDAE Oudemans.

Ent. Berichten, D1, vi, 1923, p. 206.

Ambulacra pedunculate with apical claw. Without suture between propodosoma and hysterosoma. Propodosomal shield doubtful, probably absent. Cervical setae absent. Posterior row of propodosomal setae only two. Tarsi elongate without strong spines; I and II with usual sensory rod; long seta of segment II of legs arising near middle. Genital aperture of ♀ between coxae II and III, ♂ between III and IV, in both sexes with usual pair of tubercles on each side. Male without anal discs or suckers on tarsi IV. Dorsal setae rather strong and spine-like.

Represented in Australia by the following cosmopolitan genus and species.

CARPOGLYPHUS Robin.

J. Anat. Physiol., *6*, 1869, 197–204, pl. 7–8.

With the characters as outlined for the family. Dorsal setae rather short and spine-like, simple; apex of hysterosoma with a pair of long setae and a pair of median setae. The setae of legs not plumed.

Genotype: *Acarus lactis* Linne 1763.

CARPOGLYPHUS LACTIS (Linnaeus).

(Dried-fruit Mite).

Acarus lactis Linnaeus: Syst. Nat. ed. xii, 1763, p. 1024.
Acarus passularum Hering: N. Acta Ac. Leop. xviii, 1836, p. 618.
Glyciphagus anonymus Haller: Jahresh. Ver. Württemb., xxxviii, 1882, p. 297.
Trichodactylus anonymus Berlese: A.M.S., fasc. xiv, No. 10, 1884.
Phycobius anonymus Canestrini: Prosp. Acarofauna, iii, p. 392.
Acarus dysenteriae Schrank: Enum. Ins. Austriae, 1781, p. 510.

Shape oval. Length of male 400μ, female 350μ; width of male 250μ, of female 240μ. No suture between propodosoma and hysterosoma, only 2 setae in posterior

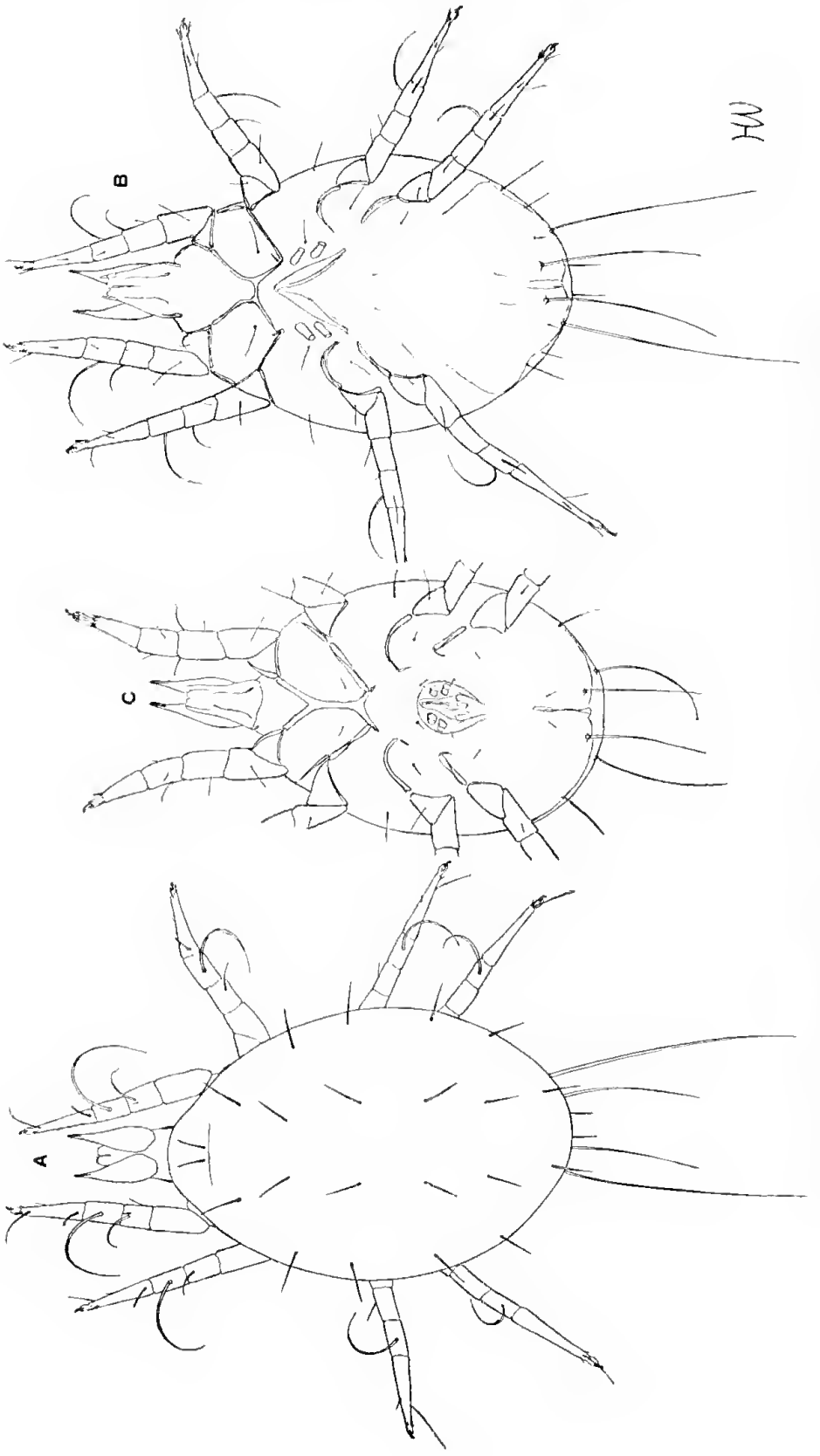

Fig. 12. *Carpoglyphus lactis* (L.) (adult): A, ♀ dorsal; B, ♀ ventral; C, ♂ ventral.

row of propodosoma. Dorsal setae relatively short and spine-like, except two pairs at posterior end. Legs relatively long and slender, with long tarsi and pedunculate caruncles; tarsi I and II with the usual basal dorsal sensory rod; the long setae on metatarsi curved and arising from about the middle; the preceding segment of leg I with two subapical setae, one fairly long, the other very short. Other characters as in the generic diagnosis and the figures. Apparently without a deutonymphal stage.

This mite commonly infests sugary material, such as dried fruit, and milk products and, from one of the following records, also scale-insects, possibly attracted by sugary secretions.

Loc. South Australia: Adelaide, 19th Jan., 1934, on dried fruits; Port Adelaide, Feb., 1932, on stored prunes. Western Australia: Upper Swan, May, 1931, on dried figs. Victoria: Melbourne (no date), on figs. New South Wales: Allandale, June, 1934, on scale-infested *Pittosporum*.

FAMILY PONTOPPIDANIIDAE Oudemans.

Entom. Berichten, D1, vii, 1927, p. 244.

This family was erected for the genus *Pontoppidania* Onds. 1923, with *Tyroglyphus littoralis* Halbert 1920, an adult species, as type. In *Ent. Ber.*, D1, vi, 1924, p. 231, Oudemans synonymizes this genus with *Calvolia* Onds. 1911, based on a two-eyed deutonymphal form. In the same publication, D1, vii, p. 247, he corrects himself, and recognizes both genera.

The family can be distinguished by the characters given in the key. It contains only the two genera *Pontoppidania* and *Calvolia*, of which the latter is represented in Australia.

CALVOLIA Oudemans.

Ent. Ber., 1911, D1, iii, p. 187.

Deutonymphal forms with a pair of eye-like organs at the apex of the propodosoma. Propodosoma and hysterosoma separated by a distinct suture. Legs III and IV very short and stumpy, without claws, IV with a pair of long setae. Sucetorial plate with 8 discs, no discs near vulva or on coxae I and III.

Genotype: The deutonymph of Michael's *Tyroglyphus heteracomus* (Brit. Tyrogl., vol. 2, 1903).

CALVOLIA GLABRA sp.nov.

Description: Deutonymph. Length 195μ, width 126μ. Dorsally with a distinct suture between propodosoma and hysterosoma, the former appearing to fit into the latter. Apex of propodosoma with a pair of distinct eye-like lenses. Dorsal

surface apparently (even under 1/12 in. oil immersion) devoid of setae, except for a pair of short ones at posterior end. Ventrally under the gnathosoma with a pair of long curved setae arising from a bilobed process. Legs I and II stout, but of moderate length, with distinct caruncle and claw, III and IV short and stumpy,

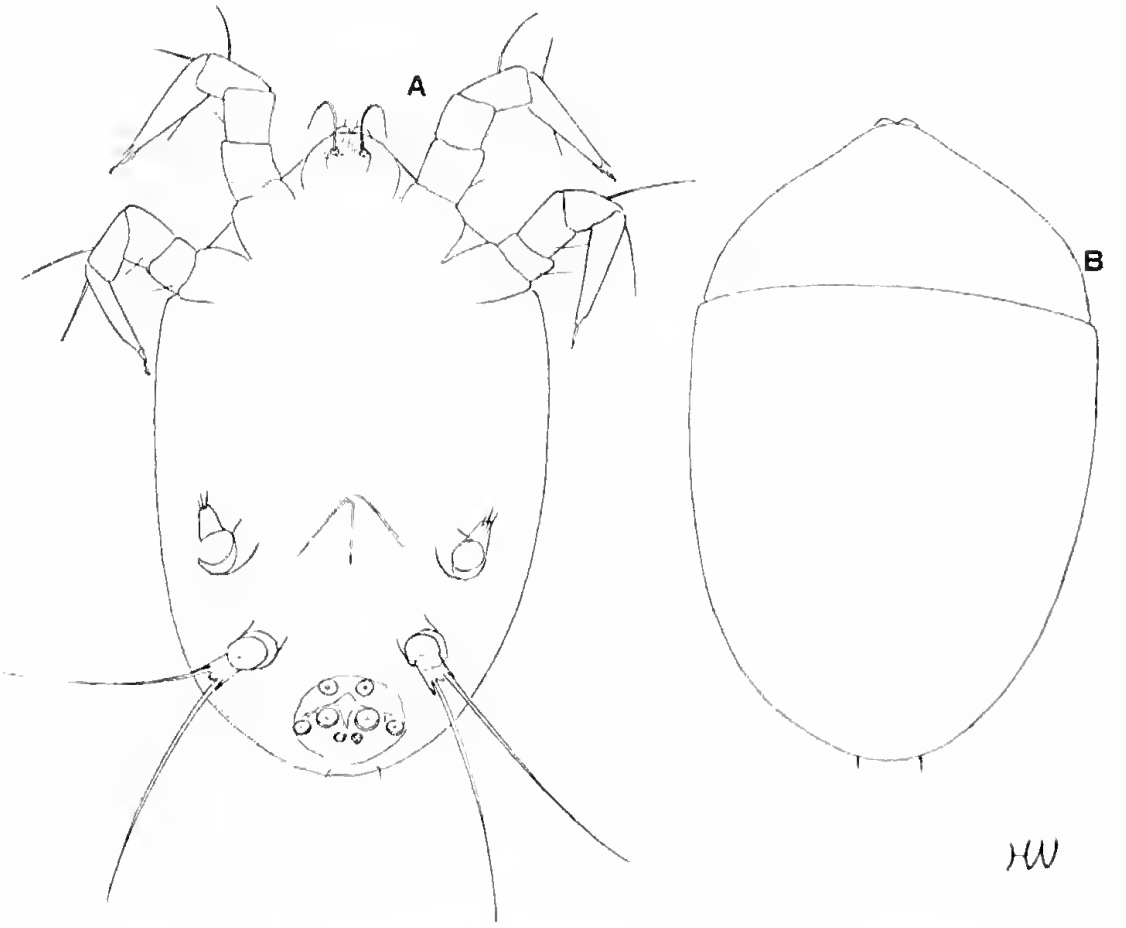

Fig. 13. *Calvolia glabra* n.sp. (deutonymph): A, ventral; B, dorsal.

without claws, IV with a pair of long setae; coxae apparently without setae. Suctorial plate with 8 discs, a large middle pair, with a smaller one on each side, a pair of still smaller ones behind, and a pair of larger ones anteriorly.

Loc. South Austral. Museum collections labelled "from the branchium of a Boa, Adelaide Zoo (A.E.J.)".

Remarks: The above record may be doubtful, but even Michael (*loc. cit.* p. 109) is not at all definite as to the habitat of what he considered the deutonymph of *T. heterocomus*, for, speaking of the species as a whole, he says that he first beat it from oak trees, and later found it in numbers in the moss of a squirrel's summer nest. He claims to have reared it by feeding on *Boletus*.

FAMILY GLYCYPHAGIDAE Berlese.

Cryptostigm., i, 1897, p. 100.

Ambulacra pedunculate with terminal claw. With indistinct suture between propodosoma and hysterosoma. Dorsum smooth or granulate; dorsal setae ciliated or feathered, long and numerous.

Of the genera placed in this family, *Glycyphagus*, *Ctenoglyphus* and *Sennertia* occur in Australia.

GLYCYPHAGUS Hering.

Acta. Acad. Caes. Leop. Car. Nat. Cur., vol. 8, pt. 2, 1838, p. 619.

Abdomen with dorsal setae long and more or less thickly ciliated, but not feathered or plume-like. Cuticle not strongly, if at all granulate. Tarsi elongate, caruncle and claws weak, tarsi I and II with sensory rod, but no spines. Genital aperture between coxae III and IV, with a pair of small tubules on each side. No discs near anus or on tarsi IV. Tip of hysterosoma with a distinctly visible copulatory tubule. Deutonymph contained within larval skin, not free-living.

The following two species have been found in Australia.

GLYCYPHAGUS DOMESTICUS (DeGeer).

Acarus domesticus DeGeer: Mem. Hist. Ins., vii. 1778, pp. 88–89.
Glycyphagus domesticus Rainbow: Rec. Aust. Mus., vi (3), 1906, p. 181.

Somewhat oval in shape with a suture line between propodosoma and hysterosoma. Propodosoma with a posterior row of 4 long, strongly ciliated setae. Cervical setae present, strongly ciliated. Dorsal setae numerous, as long as, or longer than body and strongly ciliated. Legs long, tarsi elongate, I and II with a sensory rod, but without the long scale-like seta of the next species. Claws and caruncle small. Female genitalia between coxae III and IV. Tip of hysterosoma with tubular copulatory process. Length, female to 550μ, male 500μ; width, female 400μ, male 350μ.

This species differs from the following in the lack of the long scale-like seta arising near the base of tarsi (see fig. 10D). It is a common species in dried plant material, debris from beehives, and frequently infests houses, occurring in sugar, etc., as well as in upholstery.

Loc. South Australia: Adelaide, 11th Sept., 1933, in tobacco seeds; Glen Osmond, July, 1934, in moss (R.V.S.); Adelaide, Sept., 1940, in beehive debris. Western Australia: Perth, 1931; Waroona, May, 1931. Victoria: Burnley, July, 1938 on sugar-beet (R.T.M.P.). New South Wales: Paddington, Sydney, in furniture (Rainbow).

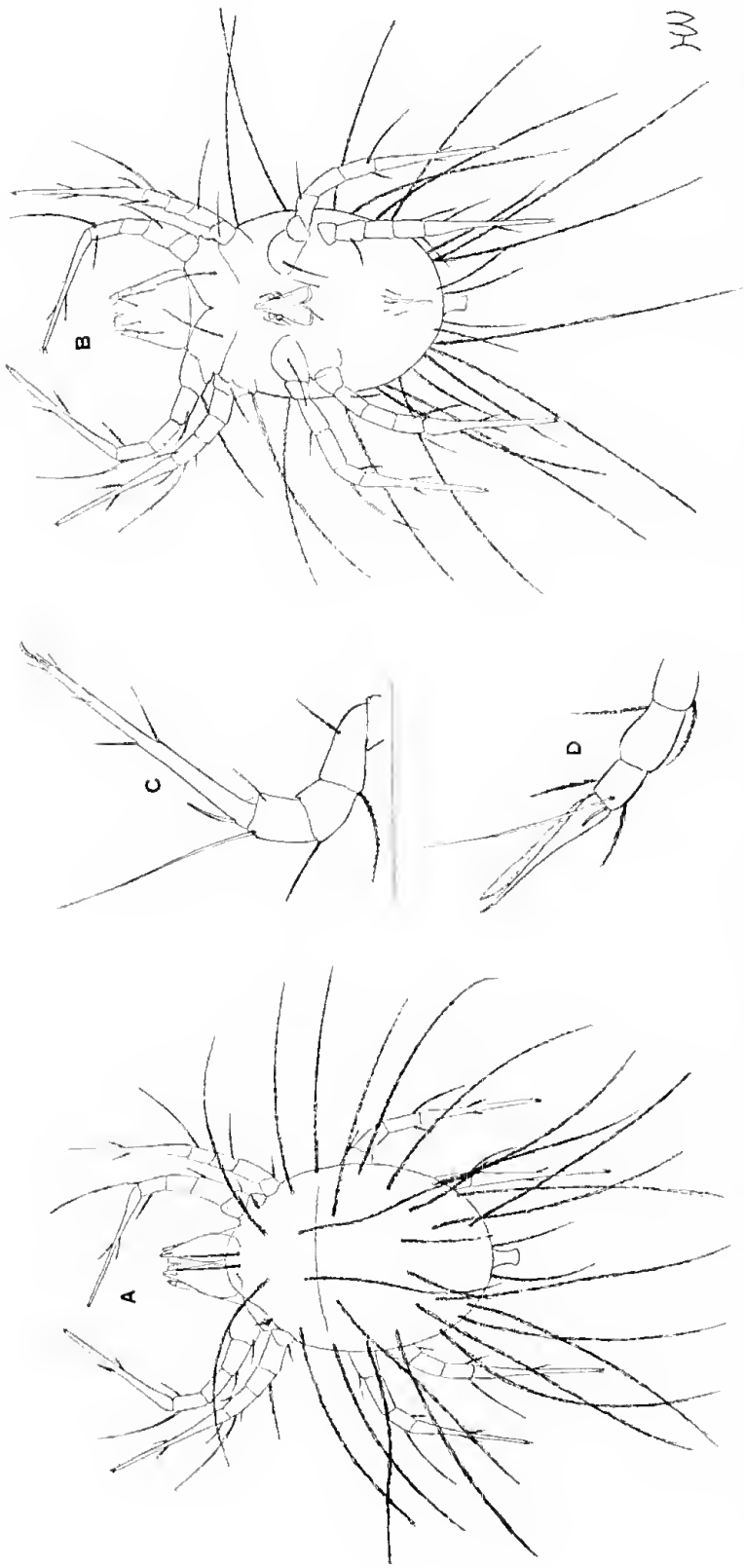

Fig. 14. A–C *Glycyphagus domesticus* (DeGeer) (adult): A, ♀ dorsal; B, ♀ ventral; C, leg 1 ♀. D, *G. cadaverum*: tarsus 1.

GLYCYPHAGUS CADAVERUM (Schrank).

Acarus cadaverum Schrank 1781 : Enum. Ins. Austriae, p. 512.

Differs only from the above in the presence of the long, scale-like seta on tarsi. It has similar habits.

Loc. South Australia : Adelaide, May, 1934, in packing straw from England ; Glen Osmond, Waite Institute, in grass seeds, March, 1936. Victoria : Melbourne, Aug., 1932, on imported seeds (R.T.M.P.) ; Melbourne, Aug., 1938.

CTENOGLYPHUS Berlese.

A.M.S., 1884, fasc. xiv, No. 1 (as *Cthenoglyphus*).

As in the genus *Glycyphagus*, but the cuticle is granular, and the setae comb-like. Legs rather shorter.

CTENOGLYPHUS PLUMIGER (Koch).

Acarus plumiger Koch, C. L. : C.M.A. Deutschl., fasc. v, 1835.
Cthenoglyphus plumiger Berlese : A.M.S., fasc. xiv, No. 1, 1884.

Rather small oval species with granular cuticle and a line or depressed suture between propodosoma and hysterosoma. Length, female to 300μ, width 200μ, male

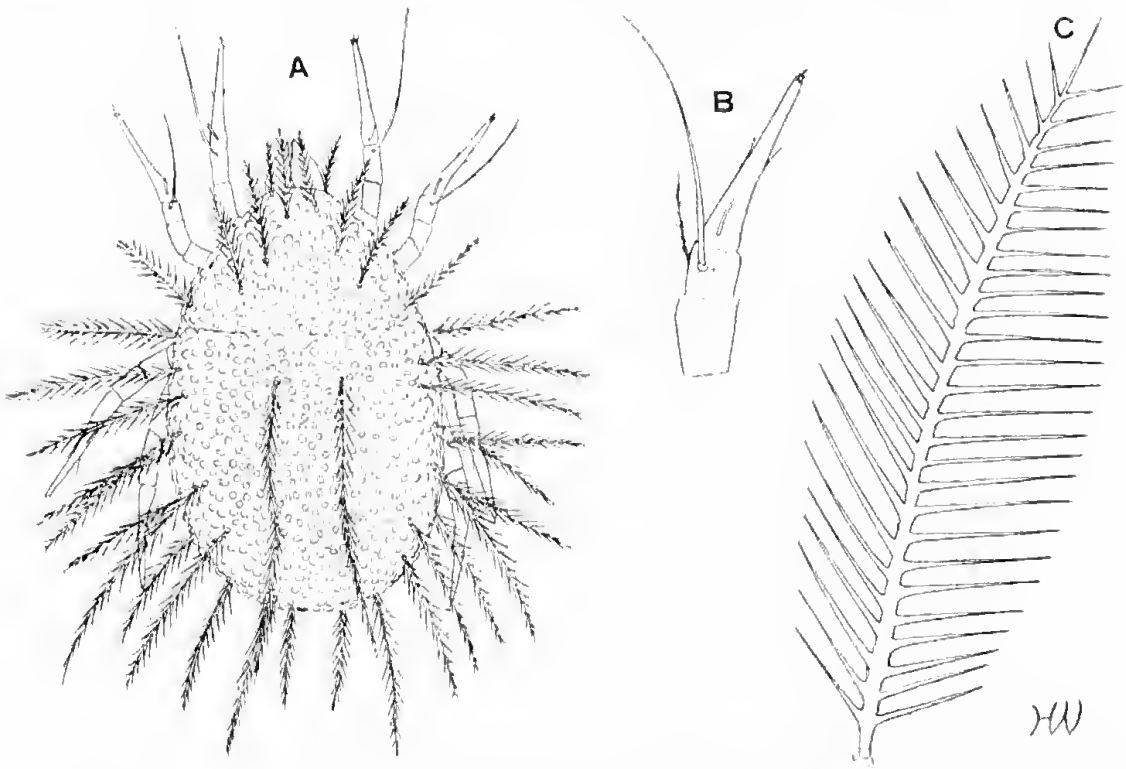

Fig. 15. *Ctenoglyphus plumiger* Koch (adult) : A, ♀ dorsal; B, tarsus 1 ♀; C, dorsal seta.

rather smaller. Legs relatively short but slender, tarsi I and II with usual sensory rod, claws and caruncle weak. Dorsal setae strongly comb-like, but the teeth straight and not curved inwards and upwards. Tarsi without long scale-like seta.

Two specimens only of this species were found amongst packing straw from England, at Adelaide in May, 1934.

SENNERTIA Oudemans.

Entom. Ber., 1905, D1, 2, p. 21.

Ambulacra with strong claws; with propodosomal plate only. Without suture line between propodosoma and hysterosoma. Dorsal setae coarse, haired or feathered, or fan-like. Epimera I united to sternum. Deutonymph; shape somewhat pentagonal, without suture. Cuticle striated, only one dorsal shield posteriorly. Dorsal setae relatively long and spine-like. Eyes absent. Legs I, II, and III with very strong sickle-shaped claws; tarsi I and II with sensory rod, IV without claws but usually with one or more long terminal setae. Venter with shorter spines; suctorial plate not in a chitinized horseshoe-like frame, with 8 discs, 2 median large, 4 small posterior and 2 small anterior ones near vulva.

Genotype: *Acarus cerambycinus* Scopoli 1763.

This genus is mainly known from the deutonymphal forms; only in a few species have the adult and other stages been described. The deutonymphs live amongst the hairs of various species of Xylocopid bees, and the adults in the nests of the same. The extraordinary large claws of the deutonymphs are specially adapted for clinging to the hairs of their host.

The following two species have been found in the hairs of specimens of bees of the genus *Xylocopa* in the collections of the South Australian Museum.

SENNERTIA QUEENSLANDICA sp.nov.

Description: Shape somewhat pentagonal. Length 410μ, width 330μ. Dorsum with a single posterior triangular shield which appears to broadly turn over to the venter, and anteriorly does not reach beyond the line of coxae III. Cuticle transversely striated, shield pitted. Dorsum with 5 pairs of stiff long spines, 162μ, but not as long as in the following species; on the shield are 6 very small fine setae. Legs moderately long and strong, tarsi I–III with strong and large grasping claws; I and II with a stout sensory rod, IV without claws but with a single long apical seta. Ventrally the setae are very fine and simple, one on coxae I, one laterally between coxae II and III, a row of four between coxae III, and one on each side between coxae IV and the suctorial plate; on the portion of dorsal shield turned

over is a pair of fairly long setae with a pair of shorter ones between. Suctorial plate as figured, with 8 discs, a median large pair, a posterior row of four very small ones, and an anterior pair of small ones, one on each side of the vulva.

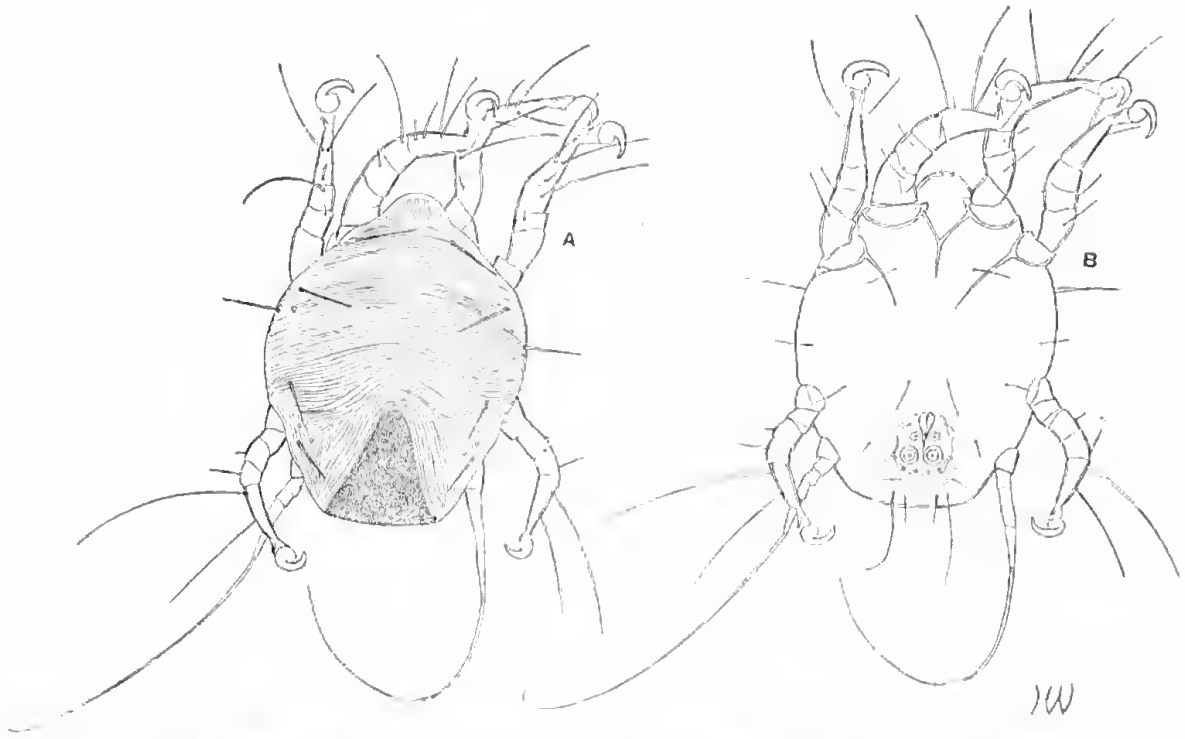

Fig. 16. *Sennertia queenslandica* sp.nov. (deutonymph): A, dorsal; B, ventral.

Loc. Moa Id., Torres Straits (S.W. Schomberg). Found amongst the hairs of specimens of *Mesotricha bryorum* in the South Australian Museum, Adelaide.

In both this and the following species the adults are unknown to me.

SENNERTIA ?BIFILIS Canestrini.

Termez. Fuzetek., 1898: vol. 21, 196; *ibid.* 1897, vol. 20, 174.

Deutonymph: Shape somewhat pentagonal. Length 250μ, width 170μ. Dorsum with a single posterior oval shield which reaches forward almost to the line of coxae II; outside of the shield with 4 pairs of long strong setae (104μ), on each shoulder a long but finer seta and a pair of similar ones at apex of hysterosoma. Legs moderately long and strong. I–III furnished with large, strong sickle-shaped grasping claws, IV without claws but with one long seta, and a very short one apically; tarsi I and II with rod-like sensory seta. Ventrally the setae are short with broad base, then tapering sharply; there is one on coxae I, one between coxae II and III laterally, a row of four between coxae III and four between coxae

IV. The ventral suctorial plate has 8 discs, a large median pair, a posterior row of four smaller ones, and anterior of the medians, a very small one on each side of the vulva.

Specimens, as described above, appear to be this species as far as I am able to judge from the meagre details given by Kramer 1899, Giard 1900 and Michael 1903. I have not been able to see Canestrini's original paper.

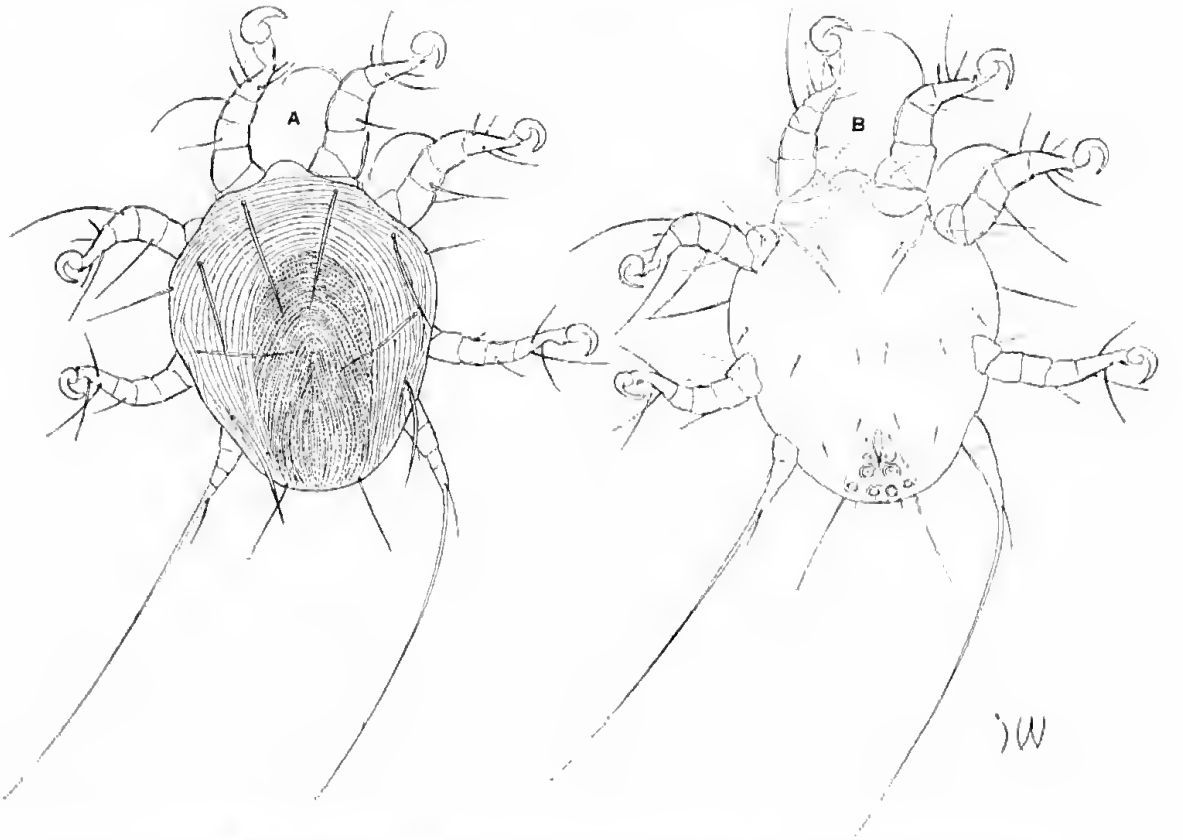

Fig. 17. *Sennertia bifilis* (Canestr. 1898) (deutonymph): A, dorsal; B, ventral.

They were found amongst the hairs of specimens of the large carpenter bee, *Mesotricha bryorum* in the collections of the South Australian Museum.

Loc. Bowen, Queensland—no date. Moa Id., Torres Strs. (J. W. Schomberg).

The species was originally described from New Guinea on *Xylocopa combinata*.

FAMILY ANOETIDAE Oudemans.

Entom. Ber., 1904, D1, i, p. 191.

Adults with mandibles provided with a more or less toothed "augur-like" process. The apical segment of the 2-segmented palpi somewhat leaf-like and with two long setae. With a suture line between the propodosoma and hysterosoma.

Ventrally there are 2 pairs of circular or oval discs, one pair in the region of coxae II and the other between coxae III and IV. Caruncle absent, claws sessile, tarsi with some small spines and I and II with sensorial rod. Without anal discs or discs on tarsus IV in male.

Deutonymph with suture between propodosoma and hysterosoma. Legs III and IV directed forwards, tibia and tarsus indefinitely separated; all legs slender, claws small, tarsi and metatarsi apically usually with clavate or spathulate long setae. Suctorial plate with 4–8 discs. With or without discs or pores on coxae and near vulva.

This family contains a large number of genera, most of which are based on the deutonymphal forms. The following are known to occur in Australia.

HISTIOSTOMA Kramer.

Arch. Naturges., 1876, vol. 42 (i), 105.

In 1904 Oudemans synonymized this genus with *Anoctus* Dujardin 1842 (L'-Institut. vol. 10 (i), fasc. 454), but later (Ent. Ber., D1, vii, p. 449–451 and viii, p. 53) he modified his views and regarded Dujardin's genus as only in part synonymous with *Histiostoma*. Both genera were based upon deutonymphal forms, the type of *Anoctus* being *Hypopus alicola* Duj. 1849 and of *Histiostoma* being *Histiostoma (Phyllostoma) pectineum* Kramer 1876 = *Hypopus feroniarum* Duf. 1839.

The only genera of which the adults appear to be at all well known are *Histiostoma* Kramer 1876, *Sellea* Oudemans 1929, and *Wichmannia* Oudemans 1929.

Adult forms with suture between propodosoma and hysterosoma, former somewhat triangular, latter quadrangular with flattened apex. Dorsum often with rounded bosses. Otherwise as in family characterizations. Deutonymph with broadly oval suctorial plate wider than long and with 8 subequal discs. A small circular pore or disc on coxae I and III and on each side of vulva.

Genotype: *Pyllostoma pectineum* Kramer 1876.

HISTIOSOMA FERONIARUM (Dufour).

The synonymy of this species seems to be very confused, but appears to be as follows:

Hypopus feroniarum Dufour: Ann. Sci. nat. ser. 2, xi, 1839, p. 278.
Tyrolglyphus rostro-serratus Megnin: J. Anat. Physiol., ix, 1873, pp. 369–78.
Phyllostoma pectineum Kramer: Arch. Naturges. xlii (i), 1876, p. 39.
Histiostoma pectineum Kramer: Arch. Naturges, xlii (i), 1876, p. 105.
Histiostoma feroniarum Kramer: Das Tierreich. Lfg. vii, 1889, p. 135.

Histiostoma rostro-serratus Michael: Brit. Tyroglyphidae, i, 1901, p. 208.
Anoetus feroniarum Oudemans: List, 1898, p. 252; Vitzthum: Tierwelt Mitteleuropas, iii, 1929, p. 80.

Female: Length to 385μ, width to 215μ. Gnathosoma distinctly visible from above in front of propodosoma. Palpi 2-segmented, the segments expanded laterally leaf-like, with 2 long setae. Mandibles with a long, toothed "angur-like"

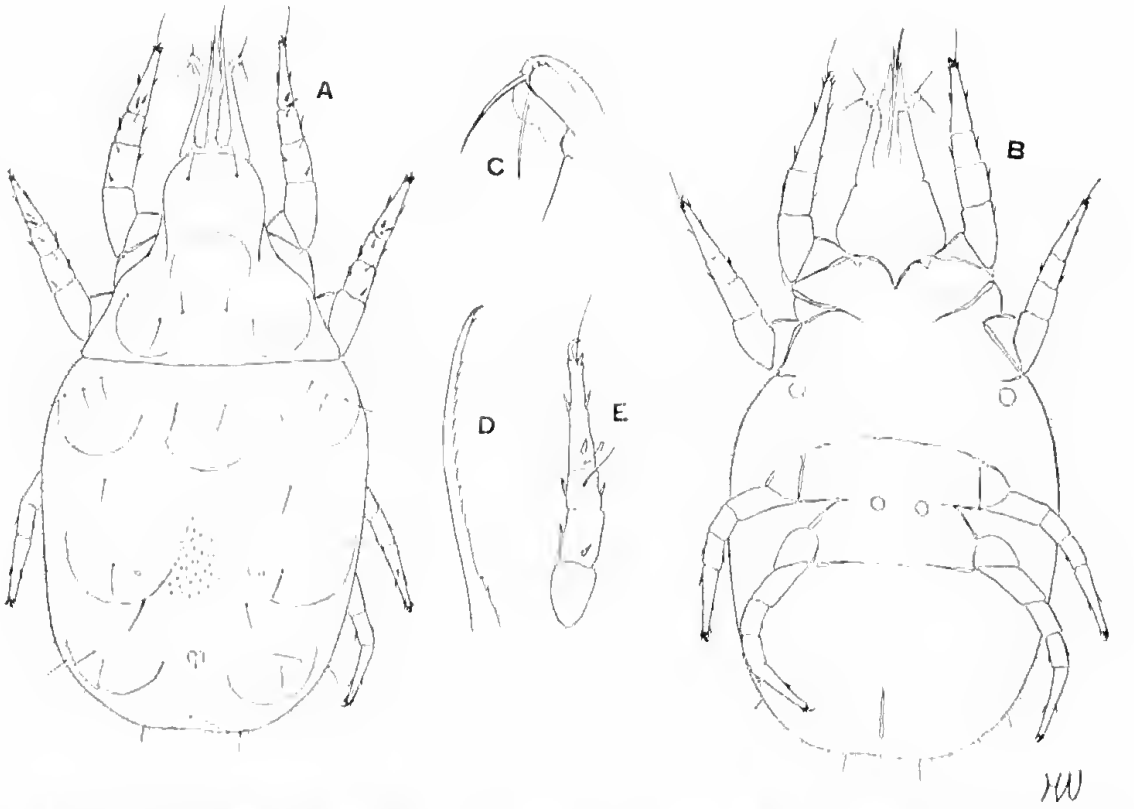

Fig. 18. *Histiostoma feroniarum* (Duf.) (adult): A, ♀ dorsal; B, ♀ ventral; C, tip of palp; D, mandibular saw-like organ; E, leg 1.

process (fig. 18d). Propodosoma triangular, separated from hysterosoma by a distinct suture; hysterosoma quadrangular. Dorsum with a number of rounded bosses, 3–4 on propodosoma and 9 on hysterosoma; dorsal setae fine and difficult to see (fig. 18a), cuticle with fine pubescence. Legs with short spines; claws sessile. The anus appears to be dorsal. Ventrally I can see no setae, but there are two pairs of circular discs or pores, one pair immediately behind coxae II and other pair in the line between coxae III and IV. The male is unknown to me.

Deutonymph: Length 185μ, width 150μ. Suture distinctly present. Dorsum apparently without any trace of setae. Ventrally as figured. Suctorial plate with

8 discs, subequal in size; a pair of small discs or pores on coxae I, coxae III and near vulva.

The material from which the above descriptions and figures are drawn I believe belongs to this species.

Loc. New South Wales: Bathurst, from dahlia tuber, 23rd Nov., 1932 (S.L.A.); Lindfield, on tiger lily, 15th May, 1932 (S.L.A.) (adults). South Australia: Mount Barker, in moss, 24th June, 1934 (H.W.); Hallet, on millipede, 1st

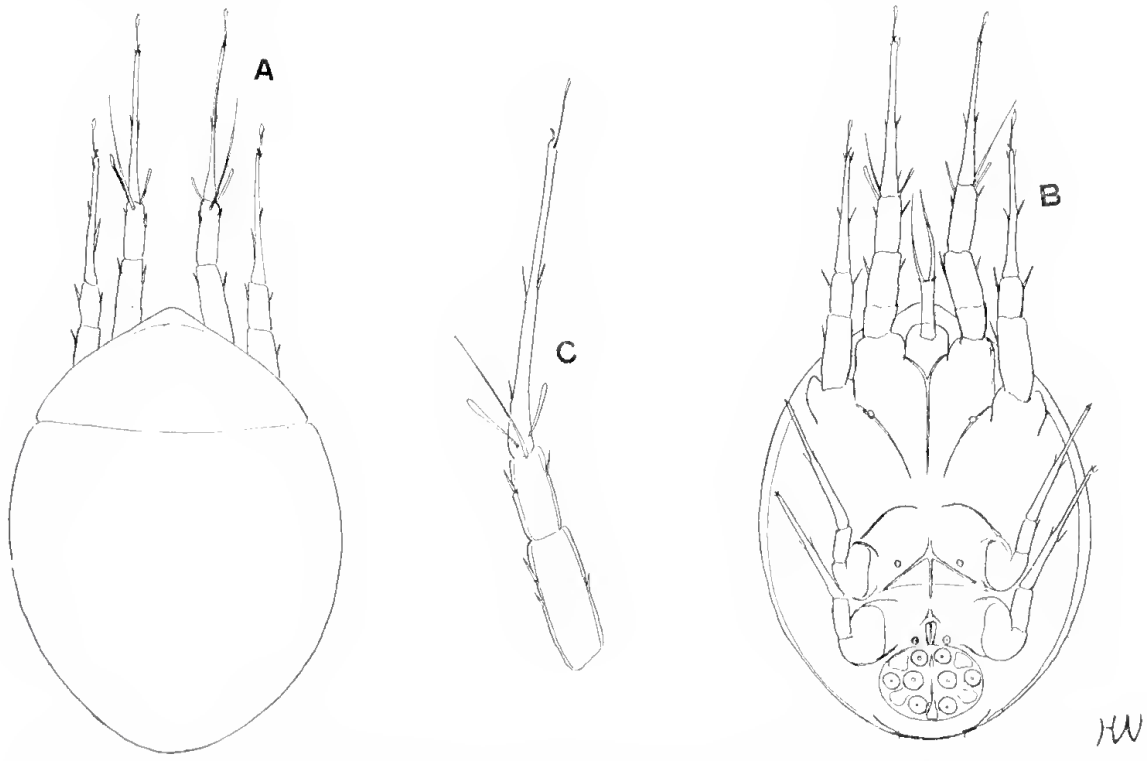

Fig. 19. *Histiostoma feroniarum* (Duf.) (deutonymph): A, dorsal; B, ventral; C, leg 1.

Oct., 1938 (D.C.S.) (deutonymphs). New Zealand: Auckland, on rotting bulbs, Jan., 1940 (W.C.) (adults).

HISTIOSTOMA NICHOLLSI sp.nov.

Description: Deutonymph, length 185μ width 135μ. Shape oval as figured with distinct suture between propodosoma and hysterosoma. Cuticle granular with long fine setae, somewhat resembling *H. lorentzi* (Ouds.), but longer and differently arranged. As in Oudemans' species, there is a striated band of cuticle near the dorsal suture. There appears to be a more hyaline area outside of the propodo- and hysterosomal shields.

Loc. Western Australia, on a small beetle from Crawley, Sept. 14, 1940 (G. Snowball).

Remarks: This species appears to be nearest to Oudemans' *Histiostoma lorentzi* from New Guinea (Ent. Ber., D1, 2, p. 223, 1906, and Nova Guinea, vol. v (i), 1906, p. 146–7).

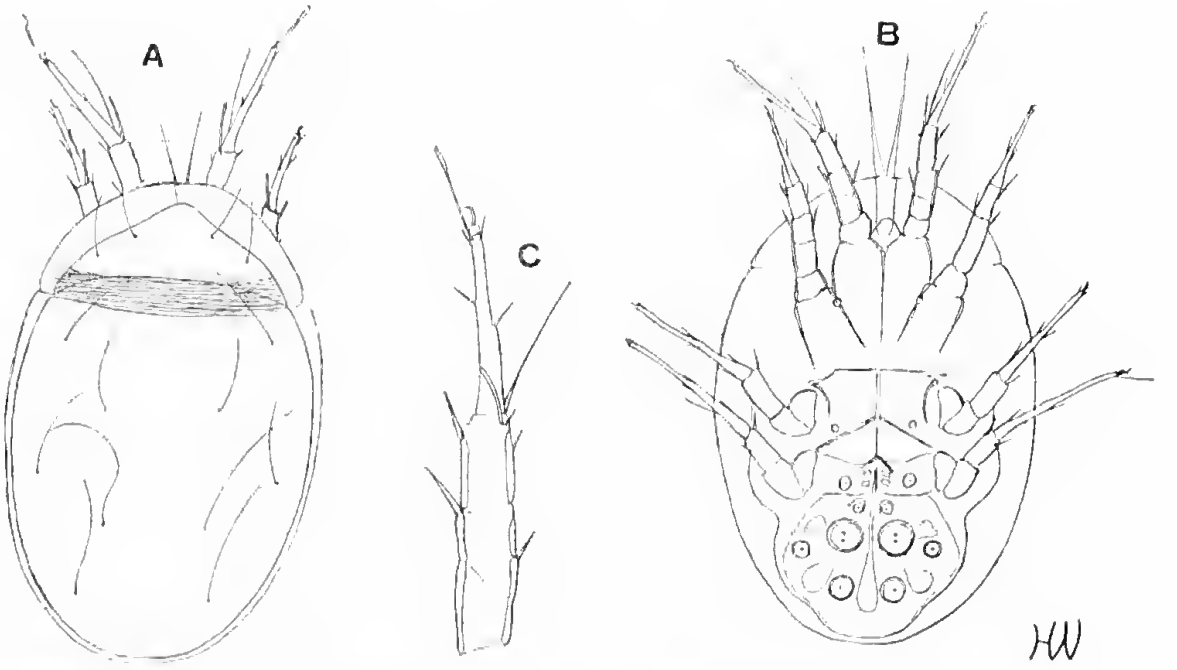

Fig. 20. *Histiostoma nicholsi* n.sp. (deutonymph): A, dorsal; B, ventral; C, leg 1.

ANOETOSTOMA gen. nov.

Differs from all other genera in which the deutonymphs have been described in the arrangement of the discs of the suctorial plate. In this plate there are only 6 discs, a median pair of large ones, posterior of which is a transverse row of 4 small ones. Off the plate and on each side of the vulva is a small disc. There are no pores or discs on any coxae. The dorsal surface lacks a suture between propodosoma and hysterosoma, but there is a transverse depression at about one-third from apex; the surface is coarsely granular.

ANOESTOSTOMA OUDEMANSI sp. nov.

Description: Deutonymph, length 165μ, width 126μ; oval, broadest at about one-third from front, no suture, but at one-third from apex a transverse depression. Dorsum apparently without setae (even under oil-immersion). Legs fairly long and slender, tarsi with small claws; tarsi I and II apically with a long clavate seta,

I at base with a long, clavate, rod-like sensory seta; second segment of leg I with long seta arising near apex, none present on leg II; tarsi III and IV with long pointed apical seta; femur of leg II with a long apical seta. Suctorial plate as in genus.

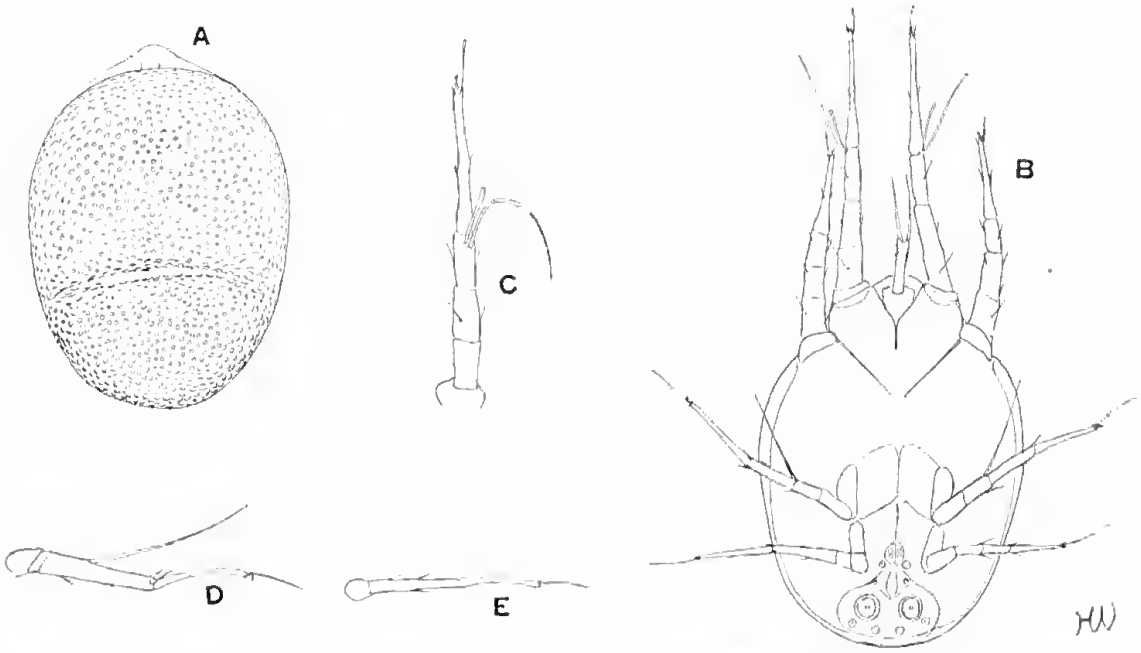

Fig. 21. *Anoctostoma oudemansi*, gen. et sp.nov. (deutonymph): A, dorsal; B, ventral; C, leg 1; D, leg 3; E, leg 4.

Loc. New South Wales: Sydney, June, 1940, on *Musca domestica* (A.L.R.).

To relate this new genus to those previously described from the deutonymphs, I give the following key:

KEY TO THE GENERA OF ANOETIDAE,
BASED ON THE DEUTONYMPH.

1. Suctorial plate with only 4 discs; no discs near vulva or on coxae I and III. *Myianoctus* Ouds. 1929.
   Type *Anoctus muscarum* (L. 1758).
   More than 4 discs on suctorial plate .. .. 2.
2. Suctorial plate with 6 discs .. .. 3.
   Suctorial plate with 8 discs . .. . 4.
3. The suctorial discs of equal size; apparently none near vulva or on coxae I or III. Leg III without the long femoral seta .. .. *Sellea* Ouds. 1929.
   Type *Histiostoma pulchrum* Michael 1901.
   The two median suctorial discs very large, others very small; a small one on each side of vulva, none on coxae. Leg III with a long femoral seta. *Anoctostoma* nov.
   Type *A. oudemansi* sp. nov.

4. Suctorial plate with 2 large discs and 6 small posterior ones arranged in a hexagon; discs near vulva and on coxae I and III *Wichmannia* Ouds. 1929.
Type *Histiostoma spiniferus* Mich. 1901.
The 6 small discs of suctorial plate arranged around the two central large ones .. .. 5.

5. Two small discs near vulva . .. . 6.
No discs near vulva, but bristles instead .. .. *Zwickia* Ouds. 1924.
Type *Anoetus guentheri* Ouds. 1915.

6. On coxae I and III a small club-like seta arising from a small basal ring.
Anoetus Duj. 1842.
Type *Hypopus alicola* Duj. 1849.
Not as above .. .. 7.

7. Coxae I or III or both with small discs .. .. 8.
Both coxae I and III without discs or setae .. *Mauduytia* Ouds. 1929.
Type *Anoetus tropicus* Ouds. 1911.

8. Small discs on both coxae I and III .. .. *Histiostoma* Kramer 1876.
Type *Histiostoma pectineum* Kramer 1876.
Small discs on coxae I but not III .. .. *Anoetoglyphus* Vitz. 1927.
Type *A. ateuchi* Vitz. 1927.
Small discs on coxae III but not I .. .. *Glyphanoetus* Ouds. 1929.
Type *G. fulmeki* Ouds. 1929.

GENERA ET SPECIES INQUIRENDAE.

Genus PULLEA Canestrini.

Canestrini Atti Ist. Veneto. ser. vi, vol. 2, 1884, p. 723, pl. ix, f.1, 1a, 1b.

PULLEA DISCOIDALIS Canestrini 1884.

Ibid.

Canestrini gives a figure of the entire dorsal view, the gnathosoma and leg I, and the suctorial plate of the deutonymph as well as a general description of the animal.

The shape is more or less round with a suture line on level of coxae II and another on level of coxae III. The dorsal setae are long and fine. There is a short but distinct caruncle and claw on all legs. In the deutonymph the discs of the suctorial plate are 6 in number, subequal, and arranged in a median row of 4 and a posterior row of 2.

Oudemans (Ent. Ber., 1924, D1, vi. p. 232 and 328) is disposed to place this genus in the Carpoglyphidae, near to *Carpoglyphus*. In the 6 discs of the suctorial plate of the deutonymph it is closely related to the genus *Sellea* Ouds. of the Anoetidae, but if Canestrini correctly associated adult and deutonymph then it cannot

possibly belong to this family, but more probably as Oudemans suggests. However, pending re-discovery, it is impossible to definitely ascertain its status.

It was found on a species of *Chrysomela* (Coleoptera) from Queensland.

TYROGLYPHUS QUEENSLANDIAE Canestrini 1884.

Ibid., p. 724, pl. ix, f.3.

This species is described from the deutonymph only. It is shown to have a dorsal furrow running backwards from the second legs, and then connecting by a transverse line. Canestrini's figure shows the suctorial discs as being on the dorsal surface; of these there are 8, a median row of 4 subequal, two in front and two behind; there is also one on each side of where the vulva should be.

It was found on a species of *Cetonia* from Queensland.

As with the previous species the description and figure do not permit of its recognition.